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Text-generation as a linguistic research task

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Text-generation as a Linguistic Research Task

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

Christian Matthiessen

1989

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A dissertation is a process as much as a product and the process leading to the present record has taken place over a long time and thus been open to many influences. It is also just one text among other texts, its 'inter-texts', and its boundaries are imposed by its institutional role rather than the various stages of the creative process and this is particularly true in my case, because of the context in which I have worked and been: many people have contributed in various ways and I am deeply grateful to all of them. The members of my dissertation committee, Marianne Celce-Murcia, Paul Schachter, and Sandy Thompson, have been generous, supportive, patient, and inspiring, as have Peter Fries, M.A.K. Halliday, and Bill Mann, who have provided similar guidance. All of them have helped shape and improve my work.

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I have been very fortunate to have been at the intersection of a number of

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although this is only a problem when ideas are conceived of as being located in an intellectual space where boundaries can be drawn.

The context at ISI has been linked up with the context created by systemic linguists, in Sydney in particular, and there have been many working visits between LA and Sydney throughout the project. M.A.K. Halliday, Ruqaiya Hasan, and Jim Martin have answered many of my questions about language in context, both theoretical and descriptive, and made me consider others that had not occurred to me. Their work and discussions with them have helped me see how text generation can be a linguistic research task without the adoption of a narrow cognitivist interpretation. Working and talking with Robin Fawcett has been very rewarding, since he has long been concerned with systemic modelling of text generation and has identified a wide range of issues that we need to focus on and ways of addressing them.

At Lund University, before I started working on the project at ISI, Bengt Sigurd showed me how text-generation can be treated as a linguistic research task and how it can shed light on language; since I left Sweden, he has maintained a supportive interest in my work.

I have also been extraordinarily lucky in having a community of flat mates and neighbours who combined friendship with interest outside of linguistics in what I was working on.

As is clear from my dissertation, I could not have begun to write it without the resources for doing linguistics that Michael Halliday has developed. From him and his work I have learned how to begin to think about language and beyond

and how to work with language. There was nothing automatic or given in the choice to pursue his ideas; but their tremendous power emerged very clearly as I was exploring different approaches within linguistics.

Halliday's work has to be understood in a helix-like progression through a series of recontextualizations. I am very much aware of this because of my gradual approximation towards an understanding, starting in Lund. The recontextualizations come about because of the multiplicity of perspectives that Halliday's work invites us to consider (stratal, metafunctional, potential and actual, etc.) and the shunting that is needed take range over these: there is nothing obscure or mysterious about this; it is simply a way of managing complexity and complementarity. It is important to emphasize, I think, that my thesis can only be taken as one move in a helix that transcends that move and can already be seen in Halliday's work.

Halliday has also helped me make sense of the whole process of doing research, partly through his gentle suggestion that we are not 'bounded by our skin' -- figuring out the implications of this notion takes a long time and will determine how we conceive of the idea of an individual generating text. In a sense, it means foregrounding dialogic interactants rather than the monologic individual and this is one of the key areas where text generation has to be re-conceived. Halliday has, then, made a tremendous and fundamental contribution to my work on the dissertation, generously taking the time in meetings across four continents to help me understand and develop the system that could generate a text like my dissertation.

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ABSTRACT OF THE DISSERTATION

Text-generation as a Linguistic Research Task

by

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Text generation or the automatic production of text by computer has come into prominence as a research task in computer science and computational linguistics in the 1980s. In this dissertation I view text generation as a linguistic research task. In particular, I focus on what I have learned from the application of linguistic models in a text generation system and on the ways in which linguistics can contribute to work on text generation. After a survey of the field, I discuss the level of lexicogrammar. Next I consider the kind of semantic interface needed to control the lexicogrammatical resources in a purposeful way. Finally, I turn to the environment in which the lexicogrammar and its semantic interface operate.

CHAPTER I.

THE TASK OF TEXT-GENERATION

0. Introduction

0.1 Applying linguistics in text generation

This thesis deals with the application of systemic theory and description to text generation. (The reasons for the choice of systemic work will be given below.) The specific context is a particular text generation system I have been involved with, the Penman system, and within this system the Nigel component, which includes a systemic grammar and a semantic interface to the rest of the Penman system, will figure prominently. As an application, text generation stands in the same relationship to theory and description as do for example parsing, pedagogic grammar, contrastive analysis, typological studies, the quest for linguistic universals, and literary studies. It is my basic assumption that linguistic theory is responsible to all applications such as these and that they all involve theory revision and extension. Application is an opportunity to work on linguistic description as well as theory: there is an ongoing dialogue between linguistics and text generation.

0.2 Perspective and readers

I will look at the exchange from the point of view of linguistics. The discussion can be seen as a partial complement to the bulk of the discourse on text generation, which is produced in a computational context. At the same time, my hope is to work towards a document that can serve as a source of reference for anybody interested in working on the problem of text generation. I say "work towards" because this is difficult to achieve the first time around: while I hope to be relevant to interdisciplinary concerns, the thesis is written in a linguistic context.

To address the need for a source of reference, I have organized the thesis along the outline of the linguistic system itself in its context rather than as an argumentative text. Since readers may come from different backgrounds, I have also tried to provide some general background and a fairly extensive glossary in an appendix. This glossary includes terms form text generation and computational linguistics as well as terms from systemic theory and systemic interpretations of English.

A good deal of the interpretation of English that I rely on is presented in Halliday's (1985) Introduction to Functional Grammar. By and large, I have to take this work for granted: to present the interpretations Halliday develops and to argue in favour of them would make the thesis impossibly long. I have attempted to organize my discussion in such a way that the descriptive sections serve to build up a context gradually. For instance, I discuss the descriptive content of a generation grammar of English in Section II:2 and this short

discussion can then serve as background for subsequent theoretical-descriptive explorations in Sections II:3.2-3 and in Chapters III and IV. Furthermore, I have included key descriptive concepts in the glossary.

While the Penman system and its Nigel component have provided me with the environment in which questions and results have arisen, my discussion is not an account of Penman or Nigel, even less a manual for potential users: there are now two pieces of documentation of Nigel. One is a user's manual (Bateman et al., 1988), intended to help users run the program itself; it also presents the organization of the Nigel program within Penman. The other is a 'tour' of the systemic-functional grammar of English developed for generation (Matthiessen, 1988), where I present the coverage of the Nigel grammar, as discussed in Section II:2, in some detail, relating it to Halliday (1985) and other systemic sources. My thesis is several steps away from these documents in abstraction. It can, however, serve as a 'companion', exploring general concerns and considerations.

While I certainly argue in favour of or assume a number of positions, my main concern is with a characterization of the space of alternative approaches within the overall model. I think it is important to identify these without necessarily selecting one alternative and rejecting the others. The usefulness of a particular approach will depend on a number of factors and different contexts often invite different approaches. In my experience, the outright rejection of a particular approach is often of a very local character. That is, the selection of a unique approach and rejection of all others is often possible only because a very small

part of the overall system is in view: once we pull back so as to be able to see more of the overall system, a number of possibilities previously rejected suddenly look feasible again. When we are dealing with a highly complex system of systems, we should not be surprised to find that there are various ways of accommodating the 'facts'.

It is partly for this reason that I have taken a fairly global view of the various aspects of text generation (it is still quite restricted, however) rather than focus on a more local aspect, pursuing it in more detail. I think it is important to try to bring out the general patterns and identify the ways in which various subsystems are related. We have to be able to shunt back and forth among the levels of the overall system and we have to be able to see how detailed issues relate to the more global view.

0.3 The notion of text generation

Research on text generation usually involves getting the computer to function as a writer for some fairly restricted writing task (or, occasionally as a speaker; cf. Sigurd, 1984): given a need for text, the computer will produce text automatically in response to this need. For example, if the computer has access to meteorological data, we can try to automate the production of weather forecasts by building a weather forecast generator. This is one kind of reasons why one might want to build a text generator; text generation research is also motivated by the need to present information stored in or produced by the computer in a database, an expert system or the like -- information that would

not otherwise be accessible to a person who is not a computer expert. Together with text-understanding and parsing and with machine translation, text generation is often known as natural language processing (NLP) and is addressed within computational linguistics.[1]

Although work on text generation is often computational and is mostly carried out in departments of computer science (or electrical engineering), research institutes concerned with computational research, or within the computer industry, this is by no means a logical necessity. There can be work on text generation by computer in a linguistics department -- Bengt Sigurd's (e.g. 1984) COMMENTATOR system developed at Lund University is a good example -- and there can be linguistic work (without any computational modelling) on how to create text -- Fawcett (1973, 1980), Halliday (1973, 1977), Chafe (1977, 1979), and Dik (1987) are evidence of this.[2] Although these examples are quite rare and most work on text and discourse is concerned with analysis, they indicate the value of *text synthesis* as a complementary approach to text analysis in the study of text and the systems instantiated in text. In other words, text synthesis could become just as valuable to discourse study as speech synthesis has become to phonetics. But the initiative has to come from within linguistics, which is why it is important to conceive of text generation as a linguistic research task.

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[1] Natural language processing does not include work on various kinds of data processing where the computer is used as a research tool to examine and discover statistical patternings.

[2] There are also examples within psycho-linguistics; but they tend to be further away from the problems I am concerned with here.

0.4 Organization of the rest of the thesis

I will now start with the discussion of the task of tex-generation. At the end of this chapter, in Section I:5, I provide an overview of the rest of the thesis.

Appendix 1 provides a glossary of terms used.

Appendix 2 provides a key to symbols.

1. Modelling text generation

Text generation systems vary quite significantly in basic design but it is possible to identify a number of key components. I will start by looking at the notion of a generation system from the perspective of text generation; I will then survey some aspects of systemic theory central to the task of modelling text generation.

1.1 The design of a representative generation system

In the design of a text-generator, one general tendency is to distinguish between system *resources* such as knowledge resources, a reader model, rhetorical resources, grammatical resources, and lexical resources; and

processes or procedures that employ these resources. Examples of processes include knowledge selection, text planning (organization), lexicogrammatical expression, and editing. The general process of generating text is often seen as goal pursuit. That is, a communicative goal is specified and the generator produces a text in order to attain this goal.[3]

The distinction between processes and resources corresponds to the differentiation in Fawcett's (1980) systemic model between the problem solver, the central processor of the system, and the resources it works with such as affective states, 'knowledge' of the universe, 'knowledge' of the addressee's informational state, and semantics.

A simple design is diagrammed below; cf. for example, Mann's (1982) presentation of the early design of the Penman generator:

[3] This characterization of text generation excludes grammar testing by random generation of grammatical units. It also tends to exclude work on generation in the context of machine translation, since the source for generation within machine translation is derived from the input language rather than from a goal outside the linguistic system. There are parallels, however, and these will tend to more significant when the machine translation systems take more levels into consideration so that translation involves identifying semantic and conceptual representations and text plans in the analysis of the source language text and using these in generating the translation in the target language. For some discussion, see McDonald (1986).

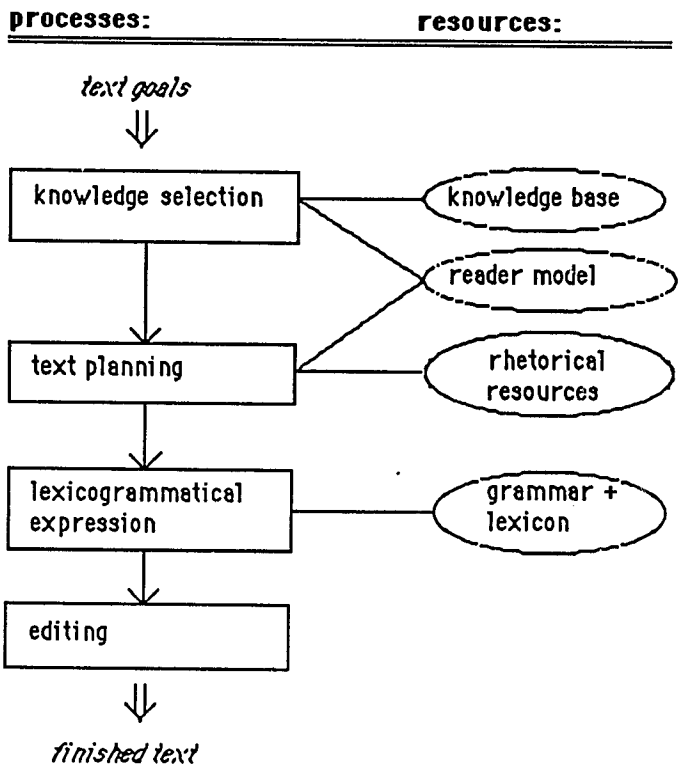

Fig. I-1: Simple sequential generator design

The generator starts by invoking a subprocess, **knowledge selection** (also called search), which extracts the relevant knowledge from the knowledge resources of the generator. The selection process is guided by a model of the intended reader, the reader model (also called the user model), so as to avoid including information already known to him or her and to include background information not known to him or her.

Next, **text planning** takes over and arranges the extracted knowledge into a rhetorical structure using the strategies offered by the rhetorical resources and consulting the reader model at the same time. In Penman, the overall organization of the text is planned in terms of *Rhetorical Structure Theory.* The result is a hierarchy cf rhetorical units; each terminal unit typically corresponds to a non-embedded clause.

Finally, the process of **lexicogrammatical expression** takes over and executes the text plan by turning it into wordings, relying on the lexicogrammatical resources. In Penman, the process of lexicogrammatical expression uses the *Nigel* component of the system. Nigel has two levels (strata) of organization, a systemic functional grammar and a semantic interface that relates this grammar to the rest of the system, the chooser and inquiry interface. Looked at from the point of view of the Nigel component, the rest of the Penman generator -- knowledge base, text plans, etc. -- constitute the *environment* in which Nigel operates. The chooser and inquiry interface interacts with the environment to obtain information needed to make motivated grammatical choices:

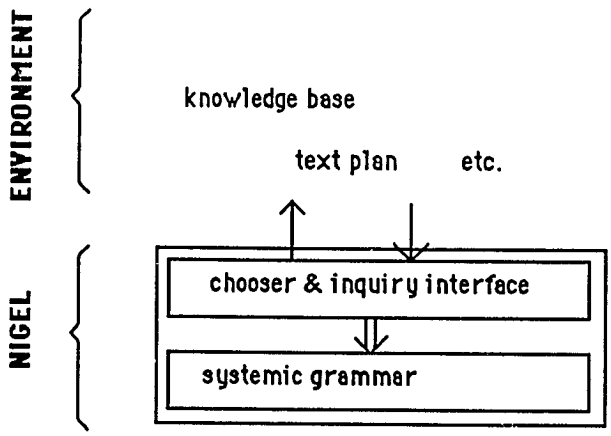

Fig. I-2: The Nigel component and its environment

The generator may include a simple monitor or **editor** that tries to improve the final output. I suggested that the design is a simple one partly because the processes in Figure 1-1 are called in a strict sequence. We can change this by interleaving knowledge selection and text planning. For example, the expansion of the text plan may lead to additional search for knowledge. Similarly, we could experiment with an editing facility that has access to the text plan as well as to the final output.

Further details of the design of the Nigel component will be given in Chapter II, which deals with the lower half of the component (systemic grammar), and Chapter III, which deals with the upper level, the interface. Chapter IV deals with the environment as seen from the Nigel component.

The simplicity of the generator design in Figure I-1 lies partly in the strictly sequential arrangement of the processes indicated in the diagram in contrast to a model where they are interleaved; cf. de Beaugrand (1984: 102 ff) on the contrast between what he calls a sequential-stage relay model and a parallel-stage interaction model. Knowledge selection and text planning should probably be interleaved rather than staged in a general model. The need to express certain knowledge has implications for text planning. For instance, the need to express a procedure means that text planning will draw on resources for sequential organization. At the same time, text planning will raise the need to select knowledge. For instance, if the reader needs to be given background information, be given evidence, be motivated, and so on, the relevant knowledge has to be selected.

Furthermore, we will eventually have to design generators that can plan and execute texts stage by stage rather than all at once. This will be particularly important when we move towards designs of more interactive generators for (casual) conversation.

To reflect the interaction between text planning and knowledge selection, we can redraw the diagram from Figure I-1 as follows. (Editing has been left out of the diagram. Resources are diagrammed inside process boxes. The products produced by the processes are italicized.)

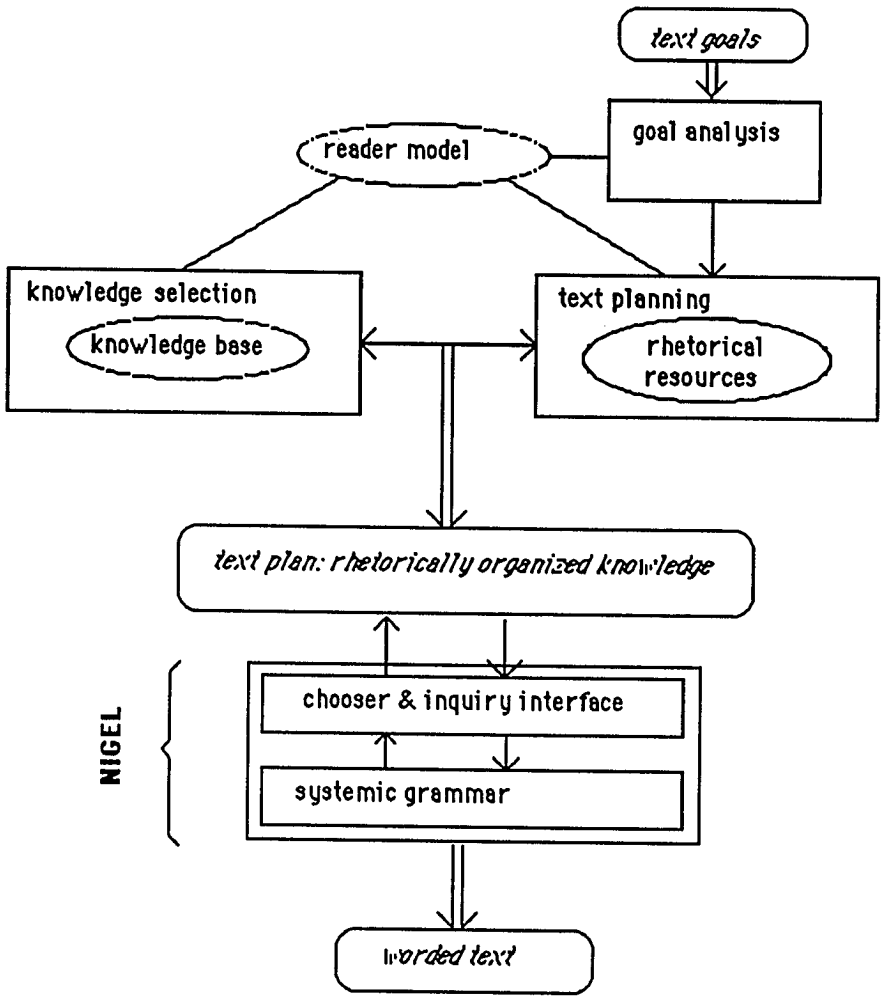

Fig. I-3: Generator design with interaction

According to this design, incoming text goals, which are stated in terms of the prospective reader, are analysed and handed off to text planning. Text planning interacts with knowledge selection in building a text plan -- knowledge organized into some kind of rhetorical structure. Both processes consult the

reader model. A sentence generator such as Nigel realizes this text plan as a text worded in English.[4]

The two design sketches in Figures I-1 and I-3 indicate some of the fundamental variables in the design of a text generation system:

What are the processes and the resources?

What is the stratal arrangement of the resources -- how many strata are there; which resources are stratally higher; which resources are stratally simultaneous? The two designs differ in the arrangement of the knowledge base and rhetorical resources. They are stratally differentiated in the first design, whereas they are not in the second model.

What is the staging of the generation processes? The stratal arrangement of the resources will determine the overall staging of the generation processes, but there are still different stagings. -- Are the processes sequential or interleaved?

There has been considerable variation in how these design questions have been addressed in the text generation systems developed to date.

[4] There will still be a need for more 'interleaving'. In particular, once the process of lexicogrammatical expression has started, it will need support by 'local' text planning such as the planning of referring expressions.

1.2 Dimensions and categories of systemic theory

Before surveying the development of text generation, I will briefly identify the dimensions and categories of systemic theory that are particularly relevant in thinking about the design of a text generation system.[5] Systemic theory is multidimensional and it is always difficult to discuss a multidimensional abstraction step by step since its value lies in its multidimensionality. The following presentation has to be read as an abstract, brief overview; many details will only emerge later. I will proceed as follows: (i) Stratal organization; (ii) Functional layering; (iii) Functional variation; (iv) Axis; (v) Rank; and (vi) Synoptic and dynamic.

These dimensions determine the modularity of the overall model; the 'modules' are defined in terms of stratal organization, metafunctional organization, rank, and so on.

(0) Organization as resource: functional interpretation

Language is interpreted in systemic theory as a ***resource*** for the speaker-listener. It leads to a view of language as essentially meaning potential available to its users. The concept of resource is fundamental; it is the basis of a multi-faceted kind of functionalism. It is closely related to a functional

[5] I have left out some important parts of systemic theorizing that may become central to text-generation sooner than the focus of my discussion would seem to suggest. These include (i) the nature of systems: the exploration of probabilistic systems and open, dynamic systmes; and (ii) the nature of the inter-stratal relation of realization in terms of the notion of metaredundancy.

interpretation of language as a stratal system of systems (see (i) below), first in the life of the child, before he or she moves into the mother tongue, as a two stratal system, and then under multi-functional pressures, as the tri-stratal system of adult language (Halliday, 1975);

an interpretation of language as functioning in context (see (i) below);

a multifunctional view of language (see (ii) below);

the notion of functional variation (see (iii)); and

the paradigmatic orientation, since a paradigm can be seen as a way of identifying the resources available to the language user (see (iv)).

As a way of construing language, 'resource' contrasts with notions such as rule system: it represents a functional rather than a formal interpretation. We can see this clearly in conceptions of grammar. Lowth (1762: x) states the task of grammar as follows:

The principal design of a Grammar of any Language is to teach us to express ourselves with propriety in that Language, and to be able to judge every phrase and form of construction, whether it be right or not. The plain way of doing this, is to lay down rules, and to illustrate them by examples. But besides shewing what is right, the matter may be further explained by pointing out what is wrong.

There are two demands on grammar here -- (i) *expressing* and (ii) *judging*. These two demands run through various conceptions of grammar -- grammar as resource and grammar as rule system; different theories will give more emphasis to one or the other, partly depending on what tasks they have been designed to deal with. The nature of the grammar will depend on which task is given prominence; as Lowth points out, judging is achieved by laying down rules; e.g.:

> When the Verb is Passive, the Agent and Object change places in the Sentence; and the thing acted upon is in the Nominative Case, and the Agent is accompanied by a Preposition. (op cit., p. 104)

In text generation, it is clearly the first demand on grammar that is the driving principle: the task of the grammar is to serve as an expressive resource. The second demand, distinguishing right and wrong, is primarily a 'safety' check. Besides, there are other systems at higher levels in a text generator that will affect whether an expression is right or wrong.

(i) Stratal organization

Language is fundamentally a resource for meaning, organized into a number of **levels** (in Firthian terms; Firth, 1957) or *strata* (in Lamb's terms), which are ordered so that higher strata are realized by lower ones (Halliday, 1961 and many other places).[6] Systemic theory does not stipulate how many strata

[6] The stratal organization is different from a componential or modular organization in that it is more highly differentiated: components (modules) may be related stratally, by rank (as syntax and morphology), by axis (paradigmatic axis vs. syntagmatic axis, see (iv) below), or by metafunctions

there are -- there have been various proposals -- but there are at least three:

semantics: resource for meaning. Since it is a resource, meaning is a functional / rhetorical / communicative notion rather than a formal / logico-philosophical one and this is reflected in two ways in the conception of semantics: (i) it is multifunctional (see further below) and (ii) it is a semantics of text (discourse).[7] The latter follows from the observation that text (rather words or sentences) is the process of communication.

lexicogrammar: resource for wording meanings, i.e., for expressing them by means of structures and 'words'. Lexicogrammar includes lexis (vocabulary) as well as grammar in one unified system; lexis is interpreted as the most specific part of grammar. Grammar includes morphology as well as syntax; the two are not stratally distinct.

phonology: resource for sounding. It includes intonational resources, which serve to realize grammatical choices directly, as well as resources of rhythm and of syllabic and phonemic articulation, which are not in a direct realization relation to grammar.

(see (ii) below); the distinctions tend to be lost if they are all treated in the same componential fashion. For instance, if syntax, morphology, and phonology are all set up as components the difference between the rank relation between syntax and morphology and the stratal relationship between these two and phonology is obscured.

[7] Conceptions of semantics are often narrower than the systemic one in any of three ways: (i) functionally, if they are only concerned with one kind of meaning, say denotational meaning, instead of the full functional spectrum of meaning; (ii) stratally, if they are defined only in terms of the categories of lexicogrammar, as say the meaning of words or sentences, instead of being defined as text semantics; and (iii) by axis (paradigmatic vs. syntagmatic), if they are only concerned with the meaning of structures but not with the meaning of choice.

Semantics and lexicogrammar together correspond to Hjelmslev's (1943) content plane and the third to his expression plane. This is important since the line of arbitrariness runs between the content plane and the expression plane but there is no such line of arbitrariness within the content plane. That is, the line of arbitrariness runs between lexicogrammar and phonology but not between semantics and lexicogrammar; lexicogrammar is functionally natural in relation to semantics:

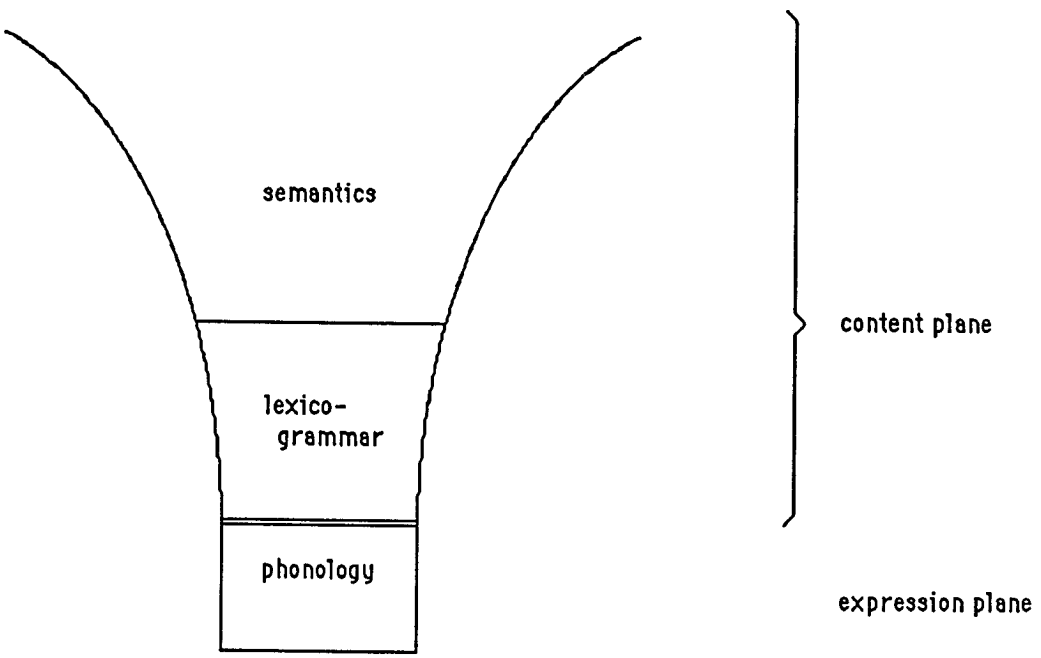

Fig. I-4: Language as a tri-stratal system

(The opening up of semantics in the diagram is meant to indicate that this stratum serves to interface with a multiplicity of uses; see (iii) below.) The dimensions of the internal organization of the strata -- the intra-stratal

organization -- will be discussed below. Two adjacent strata are related by **realization** statements: semantics is realized by lexicogrammar; and lexicogrammar is realized by phonology.[8]

As already mentioned, in contrast to the largely arbitrary relationship between lexicogrammar and phonology, the stratal line between semantics and lexicogrammar is not an arbitrary one: lexicogrammatical categories correspond directly to semantic ones. That is, lexicogrammar is functionally natural in relation to semantics:

> ... the form of the grammar relates naturally to the meanings that are being coded. A functional grammar is designed to bring this out; it is a study of wording, but one that interprets the wording by reference to what it means. ... To judge from the way language is built up by children, as language evolved in the human species it began without any grammar at all; it was a two-level system, with meanings coded directly into expressions (sounds and gestures). This is at least how children's 'protolanguage' is organized, the symbolic system they construct for themselves before starting on the mother tongue. This is then replaced, in the second year of life, by a three-level system in which meanings are first coded into wordings and these wordings are then recoded into expressions. There were various reasons why this step had to be taken if the system was to expand; it opened up both the potential for dialogue, the dynamic exchange of meanings with other people, and the potential for combining different kinds of meaning in one utterance -- using language both to think with and to act with at the same time. (Halliday, 1985: xvii-xviii)

[8] One important point here is that realization is a symbolic relationship, not a compositional (part-whole) one. Thus, text is realized by sentences, but it is not composed of sentences; similarly, morphemes are realized by (among other things) sequences of phonemes, but they are not composed of phonemes. For some discussion, see Halliday & Hasan (1976) and Halliday (1981). Realization can, in principle, be either deterministic or probabilistic; only deterministic realization will be discussed here, as it is most immediately applicable in current work on text generation. However, probabilistic realization may come into focus as a significant aspect of future text generation systems.

The semantic naturalness of lexicogrammar helps explain why there has been a fair amount of variation in the assignment of responsibility to semantics and lexicogrammar both in systemic theory and in other theories of language. Halliday has developed a functional, 'semanticky' type of grammar. This has sometimes been taken to mean that his grammar has taken over semantics, but this is not the case. Rather, his semantics is free to expand upwards, as we will see in Section III:6. Others, influenced by Hudson's (1971, 1974, 1976) work operate with a leaner, more formal grammar and as a result their versions of semantics do some of the work handled within Halliday's grammar.

The relation between semantics and grammar is affected by the strategy for creating new modes of meaning known as **grammatical metaphor**: meanings represented grammatically in one way are re-represented as if they were of another kind; processes are represented as if they were things, modalities as if they were thoughts, commands as if they were questions, and so on. There may be a congruent coding as well as a metaphorical one:

> Language has evolved in such a way that our interpretation of experience (thinking with language) and our interpersonal exchanges (acting with language) are coded into semantic structures that are plausible; and with these has evolved a lexicogrammatical system that extends the plausibility one step further, so that even at one remove we can see (or feel; the process is an unconscious one, until linguistics begins to meddle with it) the sense that lies behind the forms. A congruent expression is one in which this direct line of form to meaning to experience is maintained intact, as it is in young children's language like *man clean car*. A metaphorical expression is one in which the line is indirect. ... There is no very sharp line between the congruent and the metaphorical -- there rarely are any sharp lines in language, since it is an evolved system and not a designed one; but the distinction is an important one for text analysis and generation. (Halliday, 1985: xix)

According to the stratal arrangement above, grammar and lexis constitute one stratum rather than two; this will be discussed in more detail in Section II:4. Furthermore, syntax and morphology together constitute grammar and are not separated stratally, as they often have been in stratificational models (cf. Lockwood, 1972); they simply span different ranks on the grammatical rank scale (see Section (v) below).

Semantics is the interface between the linguistic system and the higher-level systems of the **context** in which language is embedded. The number and nature of the contextual systems depend on purpose for which the model is set up (see e.g. Halliday, 1978; 1984; Fawcett, 1980; Halliday & Hasan, 1985; and Martin, 1986). There is also variation according to different proposals in systemic linguistics. Minimally, it is important to recognize the level of context above the linguistic system:

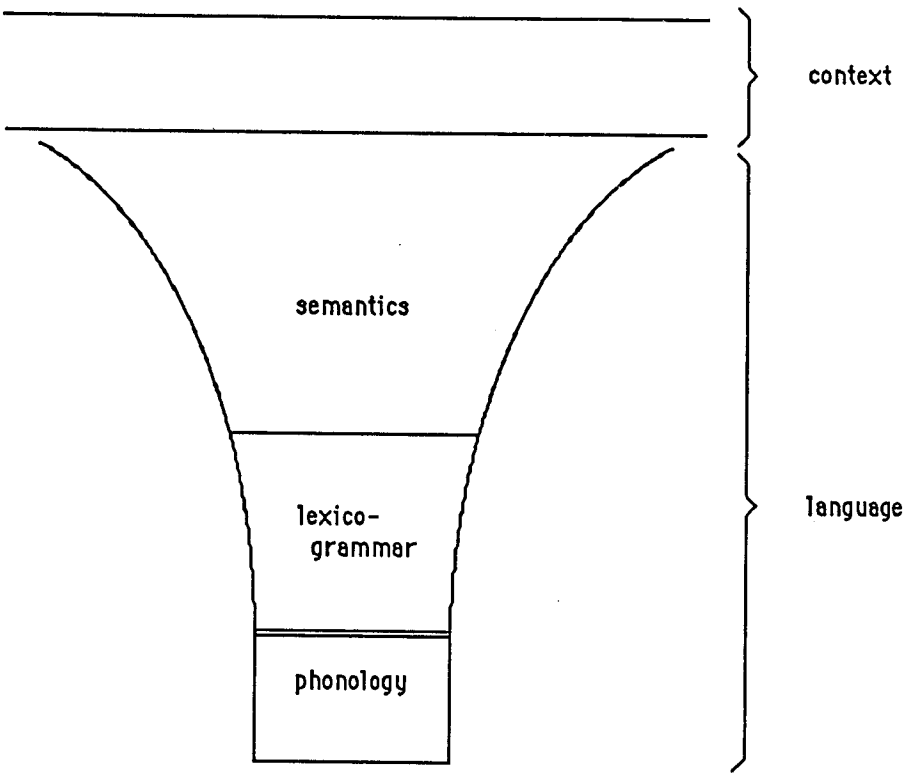

Fig. I-5: Context and language

As with lexicogrammar and semantics, there is fluidity between semantics and context in the assignment of descriptive responsibility. In the work of e.g. Halliday and Hasan (1976, 1985) semantics is text semantics: the basic unit of semantics is text, not a unit defined by grammar. Another, more traditional proposal, is to stratify this level into discourse and semantics (cf. Butler, 1985).

Work on the 'stratal' organization of context is one of the current research areas in systemic linguistics, as can be seen in the recent collections of

systemic research (e.g. Berry, 1984; Benson & Greaves, 1985; Halliday & Fawcett, 1987).[9]

There is a clear rough correspondence between the overall organization of a text generation system such as the one outlined in Figure I-3 above and the stratal organization of the model in systemic linguistics. Stratal organization has not in general been explicitly recognized in discussions of the organization of text generation systems, but many of the organizational concerns are similar to the stratal considerations that have long been modelling issues in systemic and stratificational linguistics.

(ii) Functional layering: metafunctions

The stratal organization is based on abstraction. Within the content plane (i.e., lexicogrammar and semantics), there is another type of organization that 'cuts across' the stratal organization: metafunctional layering. There are three highly generalized metafunctions -- ideational, interpersonal, and textual. They do not differ in abstraction from one another as the strata do; rather, they are simultaneous, functionally differentiated perspectives on the linguistic system.

The **ideational** metafunction is, as the name suggests, concerned with ideation: it provides the speaker with the resources for interpreting and

[9] The organization of 'context' is not necessarily a stratal one in the same way as the overall organization of the linguistic system is. In particular, Martin (e.g. 1985) has built a model using Hjelmslev's (1943) notion of *konnotationssprog*, 'connotative language'. A *konnotationssprog* has language as its expression plane.

representing 'reality'. There are two ideational subtypes, the experiential metafunction and the logical one. The former is a mode of ideation that construes experience in terms of particular components and subcomponents. It is the mode of organization of e.g. the transitivity structure of the clause (configurations of so-called deep cases, such as Actor (*she*) + Process (*gave*) + Recipient (*to the poor*)). The latter is a highly generalized mode of ideation that operates in terms of very general relations. It is the mode of organization for creating complexes of various kinds, such coordinate and appositional structures, which are chains of interdependent elements. (These different modes of organization will be exemplified and discussed in more detail in Section II:3.2.4.)

The **interpersonal** metafunction provides the speaker with the resources for creating and maintaining social relations with the listener, e.g. by assigning speech roles such as questioner and (intended) answerer and by intruding into the speech situation by giving or demanding comments on what's being said.

The **textual** metafunction enables the speaker to present ideational and interpersonal information; it provides him or her with the resources for contextualizing the information. Examples include assignments of thematic prominence and informational prominence as news.

Semantically, the interpersonal metafunction, the textual one, and the two ideational subtypes, the logical and the experiential, constitute *different modes of meaning.* Since grammar is natural grammar, there is an extremely important corollary, discussed in Halliday (1979): these different modes of

meaning are reflected in *different modes of grammatical organization.* (In particular, there are different tendencies in structural organization, but there are also paradigmatic differences.)

The metafunctions are thus principles of organization and modularity internal to the semantic and grammatical systems. But they also explain how the semantic system relates upwards, to context. To see the nature of this relationship, we first have to look at the three different aspects of context that have been identified in systemic theory (e.g. Halliday et al., 1964; Halliday, 1978; Halliday & Hasan, 1985): the field (of discourse), the tenor (of the relationship between speaker and listener), and the mode (of the discourse). These three aspects are categories of context as a higher-level semiotic organization -- "they are a conceptual framework for representing the social context as the semiotic environment in which people exchange meanings" (Halliday, 1978: 110); they can be characterized briefly as follows (from Halliday, op cit.: 142-3):

field; the field of discourse: "that which is 'going on', and has recognizable meaning in the social system; typically a complex of acts in some ordered configuration, and in which the text is playing some part, and including 'subject-matter' as one special aspect". -- "a field of significant social action" If a text is self-sufficient rather than an accompaniment that runs alongside some other social activity, the field of discourse is the subject matter of the text but it also includes the activities that make the subject matter relevant -- activities such as exploration, learning, and imagining; if the text is

'embedded' in some other social activity, this activity is also included in the field. The notion of field is related to the common notion of domain in computational linguistics.

tenor; the tenor of the relationship between speaker and listener: "the cluster of socially meaningful participant relationships, both permanent attributes of the participants and role relationships that are specific to the situation, including the speech roles, those that come into being through the exchange of verbal meanings". -- "a tenor of role relationships" Tenor thus includes roles that are brought into existence because of language -- speech roles -- as well as other social role relations.

mode; the role played by language itself in a given context of situation: "the particular status that is assigned to the text within the situation; its function in relation to the social action and the role structure, including the channel or medium, and the rhetorical mode" -- "a mode of symbolic organization"

Put very simply, field concerns natural reality, tenor social reality, and mode semiotic reality. As an illustration of how these categories come into play, considering the following example of the characterization of a situation of play involving father and son, taken from Halliday (1978):

field: "Child at play: manipulating movable objects (wheeled vehicles) with related fixtures, assisted by adult; concurrently associating (i) similar past events, (ii) similar absent objects; also evaluating objects in terms of each other and of processes."

tenor: "Small chiled and parent interacting: child determining course of action, (i) announcing own intentions, (ii) controlling actions of parents; concurrently sharing and seeking corroboration of own experience with parent."

mode: "Spoken, alternately monologue and dialogue, task-oriented; pragmatic, (i) referring to processes and objects of situation, (ii) relating to and furthering child's own actions, (iii) demanding other objects; interposed with narrative and exploratory elements."

The following text develops in this situation:[10]

Nigel [small wooden train in hand, approaching track laid along a plank sloping from chair to floor]: `Here the railway line ... but it not for the train to go on that.`

Father: `Isn't it?`

Nigel: `Yes tis. ... I wonder the train will carry the lorry` [puts train on lorry (sic)].

Father: `I wonder.`

Nigel: `Oh yes it will. ... I don't want to send the train`

[10] This is a convenient way of summarizing a text and its context. However, having done that, I should emphasize that text and context develop together, each helping to construct the other.

on this floor ... you want to send the train on the railway line [runs it up plank onto chair] ... but it doesn't go very well on the chair. ... [makes train go round in circles] The train all round and round ... it going all round and round ... [tries to reach other train] have that train ... have the blue train ('give it to me') [Father does so] ... send the blued train down the railway line ... [plank falls off chair] let me put the railway line on the chair ('you put the railway line on the chair!') [Father does so] ... [looking at blue train] Daddy put sellotape on it ('previously') ... there are very fierce lion in the train ... Daddy go and see if the lion is still there. ... Have your engine ('give me my engine').

Father: Which engine? The little black one?

Nigel: Yes ... Daddy go and find it for you ... Daddy go and find the black engine for you.

According to Halliday (e.g. 1978), each of the three metafunctions tends to serve to project one of the three different aspects of context; he sets the following correspondencies as a working hypothesis:

field -- ideational
tenor -- interpersonal
mode -- textual

That is to say, the field tends to determine ideational meanings, the tenor interpersonal ones, and the mode textual ones. For instance, the significant social action is reflected in the ideational resources of transitivity, whereas the tenor of the relations between speaker and listener is reflected in selections of mood and modality. The following table, based on one given in Halliday (1978: 117), illustrates the relationships between the categories of context and the metafunctional resources of the linguistic system:

	contextual categories	metafunctionally differentiated resources of the linguistic system	
field: socially significant action	manipulation of objects movability of objects & their relation to fixtures assistance of adult	transitivity process type and participant structure type of movement & location benefactive	ideational
tenor: relationship between interactants	interaction with parent determination of course of action enunciation of intention control of action sharing of experience seeking corroboration of experience	person mood and polarity demand, 'I want to' demand, 'I want you to' statement/question, monologue statement/question, dialogue	interpersonal
mode: the role played by the text itself	dialogue reference to situation textual cohesion: objects processes	ellipsis (question-answer) exophoric reference anaphoric reference conjunction	textual

To sum up, there is functional differentiation both in context and in the linguistic system; the functional differentiation of context and language is added to the stratal diagram in the figure below.

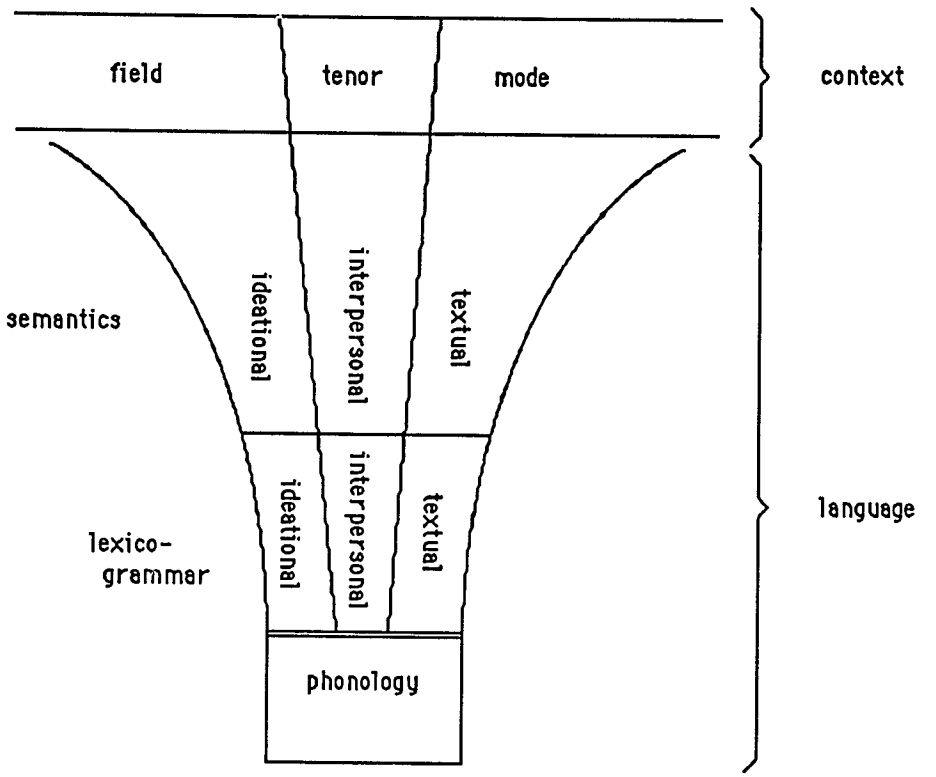

Fig. I-6: Functional layering

The metafunctions are, as already noted, simultaneous within one stratum. However, outside of systemic linguistics they have sometimes been modelled in a way that is closer to stratal organization. For example, the functional components of Functional Grammar are ordered in a stratal sort of way (cf. for example Dik, 1978). This is often tied to a lexical conception of the ideational

metafunction. As an alternative to systemic-functional lexicogrammar, we can set up a model with an ideational lexicon or dictionary that precedes syntax, which includes textual and interpersonal syntax -- what is often thought of as more 'surfacy' syntax:

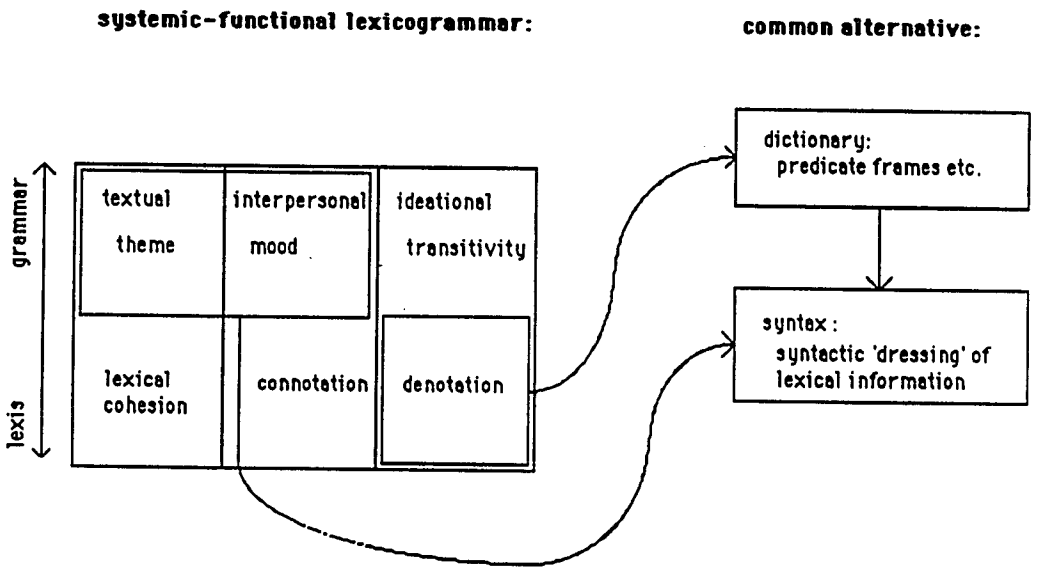

Fig. I-7: Systemic functional lexicogrammar and alternative

The "common alternative" is not a specific model, but it reflects design features that are quite common. Thus, the lexicon of a Functional Grammar contains the basic predicate frames of the model. The same is true of the predicate argument structures of lexical items in Lexical Functional Grammar (cf., for example

Bresnan, 1980). We will also see examples of this in the design of text generation systems: ideational lexis may precede the rest of lexicogrammar (as in Goldman (1974), McDonald (1980), and McKeown (1982), discussed below).

Within text generation, the emphasis has typically been on the ideational function of language and the field component of context. The latter corresponds roughly to the knowledge base of generation systems.

(iii) Functional variation

Two basic types of language variation are identified in systemic theory (see e.g. Halliday et al, 1964; Gregory, 1967; Gregory & Carroll, 1978; Halliday, 1978): dialect (including sociolect) variation and register variation. The former is variation according to user and has long been recognized, of course. It is of less immediate concern in work on text generation than the second, which is variation according to use, a generalization of the traditional notion of genre (cf. also the Prague School notion of functional dialect; e.g. Havránek, 1932). Halliday (1978: 35) characterizes a register as "what you are speaking (at the time), determined by what you are doing (nature of social activity being engaged in), and expressing diversity of social processes (social division of labour)". A register is determined by the contextual variables field, tenor, and mode. The theory of functional variation of this kind is register theory.

Register variation is of fundamental importance in text generation. Coming to grips with register variation is one of the major challenges we are faced with: full text generation systems (as opposed to sentence generation components) have so far been very restricted in register; they are story generators, stock market generators, weather forecast generators, game commentary generators, and so on.

Different registers constitute different principles of using the linguistic system; they have different text structures (generic structures) and different semantic systems. The different uses occur in different contexts of situation and the different semantic systems interface these different uses with one unified lexicogrammar:

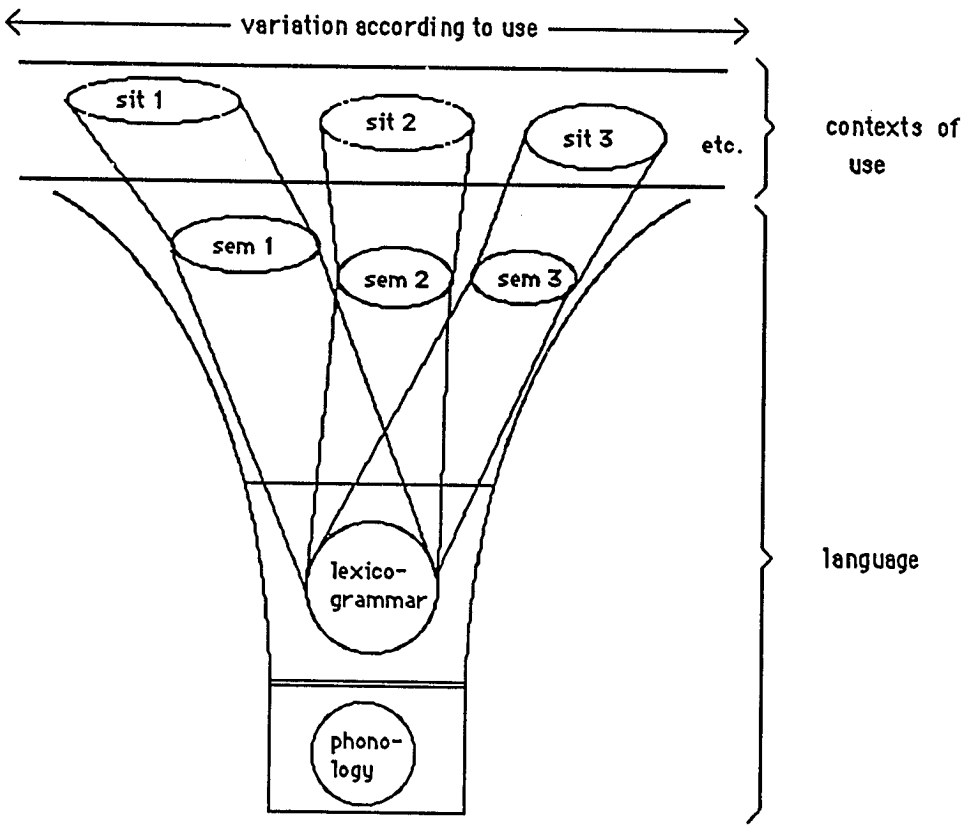

Fig. I-8: Functional variation

The approach of setting up situation-specific semantic systems as a way of interfacing between specific uses and the generalized grammar is one of the approaches to semantics in systemic linguistics. It has been used in text generation and I will return to it in Section III:6.

(iv) Axis: paradigmatic and syntagmatic

Like European structuralist traditions in general and the Firthian tradition in particular, systemic theory emphasizes the paradigmatic axis as well as the syntagmatic one. It differs from most other traditions -- including Firthian theory and stratificational linguistics -- in giving the paradigmatic axis priority: all strata in the linguistic system are construed as paradigmatically organized resources -- resources of meaning, wording, and 'sounding'. Syntagmatic specifications are derived by means of realization statements associated with paradigmatic selections; i.e., syntagmatic realizations are always given in particular paradigmatic contexts:

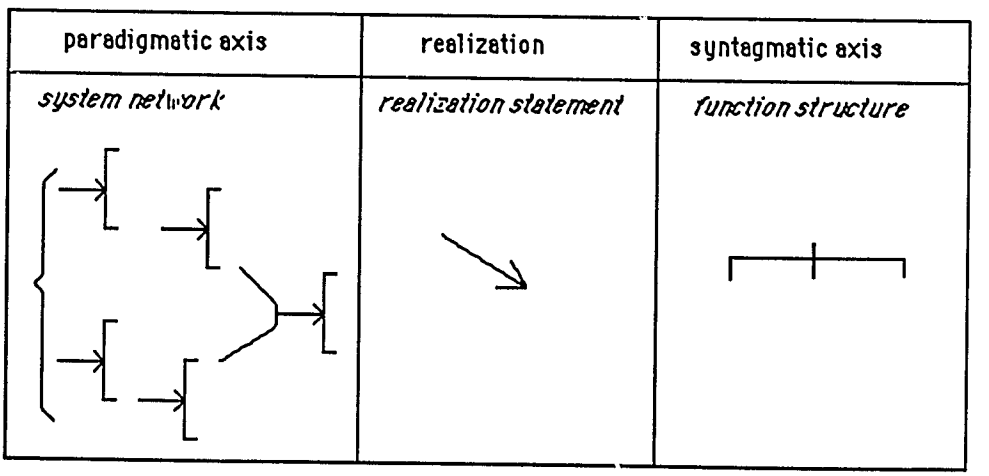

Fig. I-9: Axis and inter-axis realization

As the diagram above indicates schematically, paradigmatic organization and

syntagmatic organization are represented by means of different modes of representation. (This follows from the priority given to the paradigmatic organization, but it is unusual among linguistic theories. Even in stratificational linguistics, the same mode of representation is used for both paradigmatic organization and syntagmatic organization.)

Paradigmatic organization is represented by means of **system networks**, which are networks of inter-related choice alternatives -- the systems of systemic theory. The choice alternatives of a system are represented by features. The systems of the system network are ordered in delicacy, from least delicate (most general) to most delicate (most specific); as we will see, the ordering is partial, since systems may be simultaneous in the system network.[11] System networks are used in all strata and to all metafunctions.

Syntagmatic organization is represented by means of **function structures**, configurations of constituent functions. The concept of function structure is less general across strata and metafunctions than the system network, but it has been used in all strata and metafunctions. As already mentioned, realization statements are used to 're-express' the features of the system networks as syntagmatic specifications. While delicacy is the principle of paradigmatic organization, constituency is the principle of syntagmatic organization.

The primacy of paradigmatic organization in systemic theory corresponds to the basic need in text generation for control over the generation process. I will return to this issue in the context of the demands on the theory of grammar in

[11] At any degree of delicacy, there may thus be more than one system.

generation (Section II:1). Patten (1986) draws attention to and develops the convergence between the systemic paradigmatic interpretation of language and work within the AI problem solving paradigm in mapping out solution spaces.

(v) Rank

The organization within lexicogrammar and phonology is rank-based. The units of lexicogrammar and phonology are ordered discretely on a scale as 'largest' to 'smallest'. Each value on the scale is a rank and the scale itself is the rank scale; i.e., the scale ranks the units as 'largest' to 'smallest'. The unit of any rank consists of units of the rank next below. Through rankshift, a unit of a higher rank may serve as if it were of a lower rank. The theory does not fix the number of ranks. English grammar has four ranks and English phonology has four ranks:[12]

[12] Since these are stratally distinct and separated by the line of arbitrariness, there is no necessary correspondence between the two rank scales. In the unmarked case, the English clause corresponds to the tone group, but this is the only correspondence; and there are also marked mappings. The relationship between the tone group and the clause is mediated by another grammatical unit, the information unit, which stands outside the grammatical rank scale identified here. It will be taken up again in Section II:3.2.

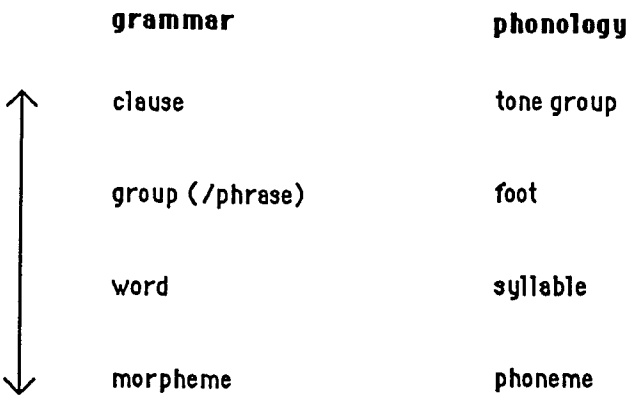

Fig. I-10: Rank in English grammar and phonology

The grammatical rank-scale in English spans clause and group (/phrase) as well as word and morpheme. It has often been broken down into two different components or strata as syntax and morphology:

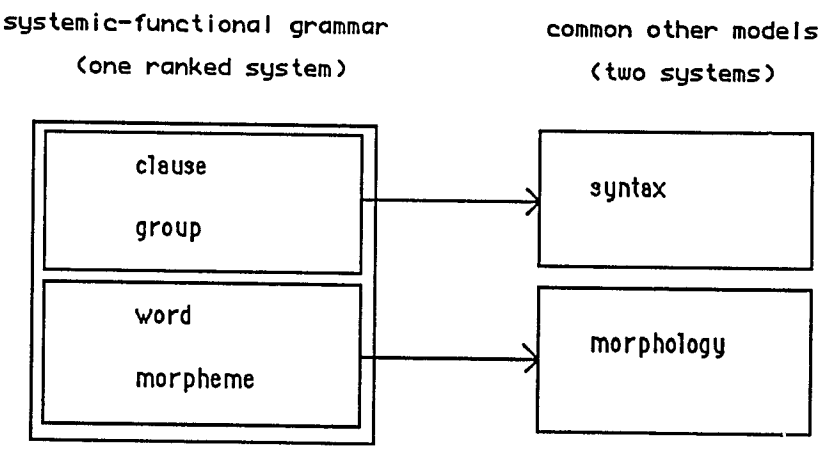

Fig. I-11: Systemic-functional grammar and alternative

However, in a systemic-functional grammar there is no reason for this separation. Both manifest the same kind of 'item and paradigm' grammar (cf. Hudson, 1972/81) and within it word grammar stands in the same relation to group grammar as the latter does to clause grammar. Further, all of these stand in the same kind of realizational relation to phonology.

The rank-based constituency of systemic-functional grammar (and phonology) differs from the immediate constituency of formal grammar (and phonology). The former is associated with minimal functional bracketing, while the latter works with maximal bracketing in terms of grammatical classes.

The functional nature of constituents has been important in developing a framework for associating them with semantic correlates; see further Section III:1.

Rank is also applicable at the semantic stratum. If the approach of situation-specific semantic systems is taken, we will, however, find more than one semantic rank scale. I will touch on this issue in Section III:6.

(vi) Synoptic and dynamic

The dimensions and categories of the theory outlined above serve in a characterization of the linguistic system at rest -- a synoptic or static view of the potential of the system. But the theory also has to take account of the actualization of the potential. In the context of text generation, this means that

the theory has to specify the constructs from which generation algorithms can be built. In general, it is assumed that if it is sequential,[13] actualization of the system potential means

(i) moving down the stratal organization; and

(ii) within a given stratum, moving towards increasing delicacy and decreasing rank.

Furthermore, it is assumed that the metafunctions are, in principle, activated in parallel. A graphic representation of activation is given below.

[13] The assumption about sequentiality is important, since it is a restriction that comes from our ability to model the processes, not from the theory. It is easy to interpret a stratal theory in a temporal way, and descriptions of it often invites such an interpretation, but both Halliday and Lamb have warned against this type of interpretation. However, a stratal theory is an invitation to models of parallel processing.

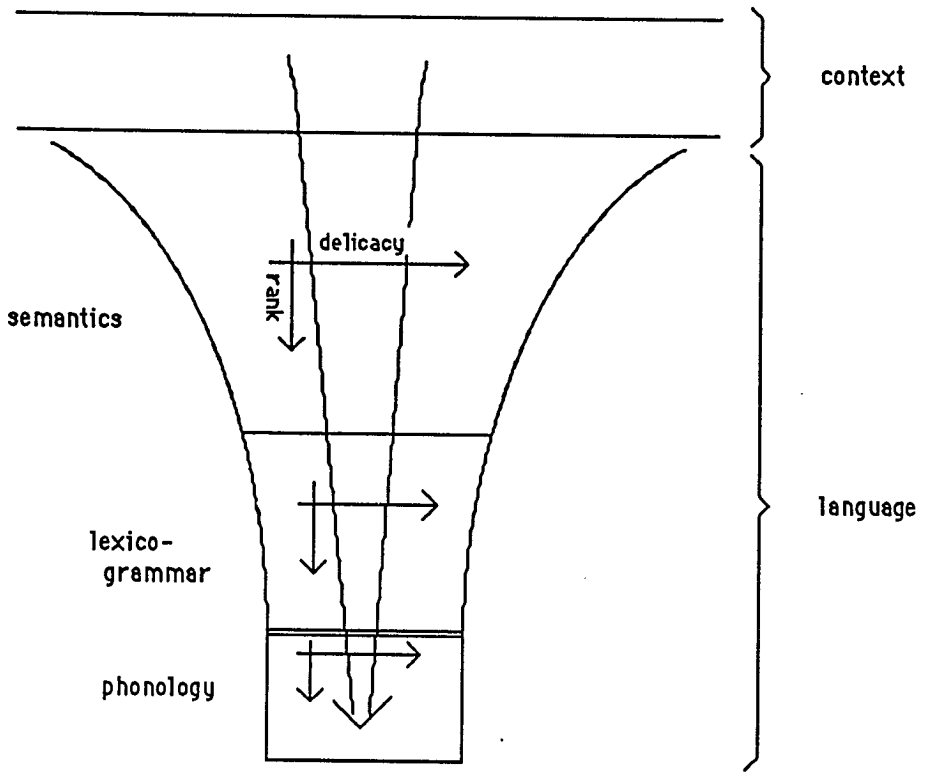

Fig. I-12: Activation

The overall directions of the activation 'movements' are the predominant ones; they do not exclude operations such as shunting between strata and moving backwards in delicacy from a preselected feature in a system network to determine what features it presupposes.

The activation of the system potential is an area where a good deal of work is needed and issues associated with a dynamic view of the linguistic system and the context in which it is embedded have come into focus in current systemic

research (see e.g., Martin, 1985; Ventola, 1984, 1987). I will discuss generation algorithms in Sections II:1.2.1.6 and III:4.5.

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The dimensions and categories of systemic theory mentioned above do not lead to a unique, restrictive model. That is not their purpose; rather they are intended to provide the linguist with a flexi-model so that he or she can play off strata, ranks, axes, and so on against one another. The overall model embodied in the theory is an extravagant one: there is full specification at all strata, both axes, all metafunctions, all ranks, and so on. Specific purposes may lead to reduced versions of the full abstract model. Halliday (1985) comments on the role of the theory and its properties of elasticity and extravagance:

Systemic theory is designed not so much to prove things as to do things. It is a form of praxis. I have often emphasized that language, both in nature and in its ontogenetic development, clearly reveals a dual function; it is at once, and inseperably, a means of action and a means of reflection. Linguistics, as a metalanguage, has to serve the same twofold purpose. Systemic theory is explicitly constructed both for thinking with and for acting with. Hence -- like language, again -- it is rather elastic and rather extravagant. To be an effective tool for these purposes, a theory of language may have to share these properties with language itself: to be non-rigid, so that it can be stretched and squeezed into various shapes as required, and to be non-parsimonious, so that it has more power at its disposal than is actually needed in any one context.

To this I would add that the role of theory is not primarily to constrain possible descriptions but to help us think of new ones. This is an important consideration in text generation where we are faced with new descriptive problems.

As we will see, there has been considerable variation in the designs of text generators. In certain respects, different designs represent alternative, mutually exclusive ways of solving text generation problems. But, at the same time, the differences are often due to the partialness of the models: to put it in terms of the full systemic model, they may be designed for one register, they may give priority to one of the metafunctions (always the ideational one), they may give priority to ideational lexis over grammar, and so on.

Because of its extensive coverage of language and context and because of its 'extravagance' or richness, systemic theory relates to various lines of research in linguistics. These relations need a thorough presentation but I will just mention some examples here. There have always been parallels between systemic linguistics, tagmemics and stratificational theory; but there are also parallels with more recently emerging approaches.

For instance, systemic functionalism, developed in the 1960s from the Malinowski-Firth tradition and Prague School work, relates to the various functional approaches that have emerged in the 1970s, often as reactions against the formal approach of the 1960s. This includes work on discourse as well as work on grammar. Thus, there are parallels with Functional Grammar (e.g., Dik, 1978) and Role and Reference Grammar (e.g., Van Valin & Foley, 1980; Foley & Van Valin, 1984).

There are also interesting similarities between the kind of grammatical representation that was developed within systemic theory in the 1960s, continuing in the work on the Nigel grammar, for instance, and the 'feature and function' grammars that were developed in the late 1970s and 1980s -- for instance, Functional Unification Grammar, Lexical Functional Grammar, and Generalized Phrase Structure Grammar: see Winograd (1983: Chapter 6), who moves into this family of grammars from systemic-functional grammar. Another way of looking at this family is through the notion of unification; Shieber (1986) discusses unification-based grammars. He leaves out systemic-functional grammar, but the connection has been studied and discussed by Kasper (e.g., 1988).

2. Development of text generation in relation to systemics

I will now turn to a brief survey of the development of text generation, noting its relevance in relation to systemic linguistics in particular.[14] I will start with interaction between systemic linguistics and natural language processing before systemic work was used in the service of text generation, since it serves as a background to later work on text generation.

[14] This survey is in no way exhaustive. It leaves out work on machine translation and grammar testing (for reasons metioned above) and also work on explanation in the context of expert systems (cf. for example, Swartout, 1983). Mann et al. (1981) provide a survey and bibliography from the beginning of the 1980s. Kempen (1986) offers a survey of the field of language generation up to the mid 1980s.

2.1 Systemics and NLP before text generation

The interaction between computation and systemic linguistics did not start with text generation; machine translation and parsing preceded. This reflects the general development of computational linguistics: text generation is a more recent development than machine translation and parsing (and text understanding). The interaction can be said to have started with Michael Halliday's participation in an early machine translation project in Cambridge in the mid 1950s led by Margaret Masterman. Other participants included Martin Kay and Arthur Parker-Rhodes. One outcome of the work was Halliday's (1956) paper on the potential for a mechanical thesaurus as a strategy for coping with the lack of translation equivalence; the thesaurus has remained central to the systemic theory of lexis (cf. Section II:4).

Kay went on to develop Functional Unification Grammar as a grammar for computational uses (first described in Kay, 1979), which turned out to be more like systemic functional grammar than any other grammatical framework (Kay, p.c., 1980; for a comparison of the two, see e.g. Kasper, 1987/8). Like systemic functional grammar, it has been used in text generation (for example by McKeown, 1982; see below).

Parker-Rhodes (1978) proposes a graph notation for the representation of meaning, which differs from most semantic nets in that he takes account of textual (e.g. Halliday's information focus) and interpersonal meaning in addition to ideational meaning.

In the mid 1960s, Henrici (1966) analysed the system network in computational terms. One result was the identification of the problem of how to handle recursive logical systems in a computer application of systemic grammar. Logical systems remained unaddressed in computational systemic grammars, but Bateman et al (1987) show how they can be handled in a generation grammar.

Around 1967, Terry Winograd studied with Halliday in London; the influence of systemic theory on him can be seen both in Winograd (1972) and in Winograd (1983). He built one of the milestone artificial intelligence systems for performing actions in and answering questions about a simple world, SHRDLU (see e.g. Winograd, 1972), which was significant in a number of ways. Perhaps the most obvious from a systemic point of view is Winograd's use of a systemic grammar at a time when most of the attention on linguistic grammars was directed towards transformational work and there were few grammatical alternatives being considered in computational linguistics.[15] But his system is also of interest in other respects. It demonstrated what can be achieved in artificial intelligence by creating a well-bounded so-called micro-world -- in this case, the blocks world of the SHRDLU system.

The SHRDLU system is capable of answering questions about the arrangement of blocks of various shapes and colours on a table top and can also comply with commands to manipulate the blocks.I think it is useful to make the connection between SHRDLU and systemic register theory: what Winograd's system can do corresponds to a fairly closed register. This is not a

[15] Within computational linguistics itself, Woods (1970) was developing transition network grammars.

drawback; rather, it is an indication of how work of this kind might be guided by register theory. Once a particular "language processing task" has been located in a register space, we will have a fair idea of what it will take to extend the system that can deal with the task. This is of considerable importance in natural language processing, I think. The micro-world approach of AI has come under attack because, it is argued, it does not deal with the general issues of 'intelligence' (cf. Dreyfus, 1981). However, one thing register theory is intended to do is relate specific to general and to relate closed registers to more open ones. That is, we can think of a 'micro-world' as a very restricted field of discourse.

Further, Winograd's work also showed the value of a procedural approach to semantics; Fawcett (1980) discusses this and other aspects of Winograd's system in relation to systemic theory.[16]

Winograd and his work have influenced the development of text generation in at least two ways, to be discussed further below. One of the first text generation systems to be built, Davey's (1978) Proteus, was based on a systemic grammar. In addition, Winograd's student David McDonald developed a systemic-like grammar, which has become one of the primary generation grammars and has been used for a variety of generation tasks.

[16] In the 1970s, there was an opposition between a procedural approach to the representation of meaning and information in general and a declarativist one. The current preference is to separate procedures from declarations, as was done in the overview in Figure I-1, by distinguishing processes (procedures) from declarative information (resources). One reason is that this makes it possible to rely on the same resource in generation procedures as well as in parsing procedures. In this connection, it is important to remember that system networks can be read both as declarations (classifications) and as procedures, although logical recursive systems constitute a special 'dynamic' type; cf. Chapter II.

2.2 The development of text generation

As already noted, work on text generation started later in computational linguistics than work on machine translation and text understanding; its research community has also been considerably smaller, although it seems to be growing steadily now. The research questions have often been different from the ones we find in work on parsing. It seems reasonable to say that generation is treated primarily as a functional problem, whereas work on parsing is often concerned with the formal behaviour of different kinds of parsing algorithm and problems posed by syntactic constructions given special attention in formal syntax.

The earliest work in 'language generation' was not text generation. Rather, it was random sentence generation, which serves the purpose of testing a grammar (cf. Friedman, 1969).

Davey's Proteus. One of the earliest contributions to text generation -- and still one of the most impressive -- was Davey's (1978) Proteus system, built in the early 1970s. It was a genuine text generation system in that it planned and produced texts rather than focussing only on lexicogrammatical expression. It generated short transcripts describing games of noughts and crosses (tic-tac-toe) played by the system. The quality of the output was due partly to the sophistication of Proteus' grammatical component, a systemic grammar. Proteus was able to generate extended text but did not use a general theory of text organization. The following game transcript was produced by Proteus:

```
The game started with my taking a corner, and you took
an adjacent one. I threatened you by taking the middle
of the edge opposite that and adjacent to the one which
I had just taken but you blocked it and threatened me. I
blocked your diagonal and forked you, If you had blocked
mine, you would have forked me, but you took the middle
of the edge opposite the corner which I took first and
the one which you had just taken and so I won by
completing my diagonal.
```

The text illustrates some of the strengths of Proteus:

- It can group coherent moves into clause complexes.

- It can discover and signal contrasts (*but*).

- It can handle fairly complex referring tasks.

The organization of the game guides the organization of the text; rhetorically, it is dependent on and specific to the field of playing noughts and crosses. A rought sketch of generation in Proteus is given below.

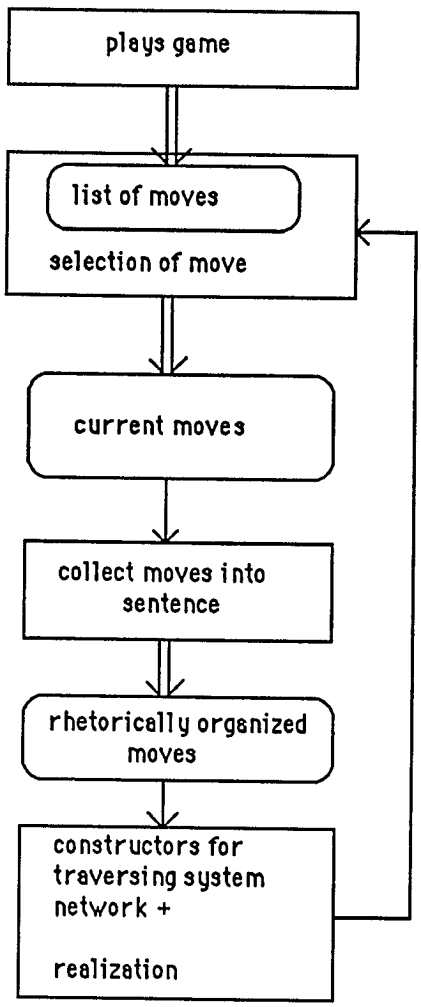


Fig. I-13: Generation in Proteus

Davey (1978: 110) offers the following summary of how Proteus generates text:

> The input of the program is a list of moves in a game of noughts and crosses. The moves are taken to have occurred in the order given and must be legal in that order.

Proteus *selects* the information to be expressed from this list:

> Given this list of moves, the program decides what moves are to be described in the first sentence and then describes them, making each move on a board in its memory as it describes it.
>
> It then returns to the list of moves, to design and construct the next sentence, repeating the cycle until it has described the last move.

Moves are grouped into a sentence (clause complex) to reflect "tactical coherence" in a game -- coherence according to the organization of the field of games of noughts and crosses. Proteus builds a tree, using its systemic grammar:

> For each type of node [in the tree, CM] there is a specialist procedure that grows the immediate descendant nodes. ... A [semantic, CM] representation of the item's meaning [the semantic information to be conveyed, CM], accompanied by a partial grammatical description [preselected set of features, CM], is given to the constructor procedure appropriate to that type of item.

For example, in constructing *Bill kicked the ball,* the construction starts with a preselection of the features clause, past, and finite and the Semantic Representation.

The constructor completes the description by reference to the [semantic, CM] representation and perhaps to other criteria. ... Each constructor specialises in traversing the systems sub-net for its type of item: it knows how to select the right feature from each relevant system.

In the example *Bill kicked the ball,* the constructor for the clause produces a set of clause features -- clause, past, finite, and goal-transitive.

In making these selections, the procedure may use syntactic information, and semantic specialists that can report what game situation has been reached in the description so far, what has been mentioned recently, what other moves the current sentence will describe, and so on.

Once a full set of features has been chosen by the construction procedure, the system applies the appropriate feature realization rules. The result is a function structure, SUBJECT PROCESS OBJECT in the example *Bill kicked the ball.* Next, function realization rules are applied to each constituent. SUBJECT is realized as nominal group, PROCESS as verbal group, and OBJECT as nominal group. The construction cycle can now start over, traversing the subnetworks for each constituent. The cycles are repeated until all the nodes in the syntactic tree are words.

Simmons & Slocum. At about the same time as Davey's Proteus, Simmons & Slocum (1972) showed how a transition network grammar could be used in generation of sentences from a semantic input, thus focussing on lexicogrammatical expression (cf. Fig. I-1) rather than the whole generation process. If information is stored in a semantic (conceptual) net, this information can be 'translated' into wordings by making appropriate structural choices in the transition network grammar. The arcs in the transition network correspond to constructs from the semantic net, such as case roles, and they have associated

procedures which build grammatical structures, (As we will see, transition nets were used later in a similar way by McKeown (1982) to represent text structures rather than grammatical structures.)

Goldman's BABEL. The technique of using transition networks was taken up by Goldman (1974). He also developed a new approach to lexical selection, using discrimination nets to organize the selection process hierarchically. The input to the generation process is a conceptual dependency expression. The first step is to select appropriate lexical items by means of the lexical discrimination networks. Next, these are linearized and specified morphologically in the traversal of the transition network grammar:

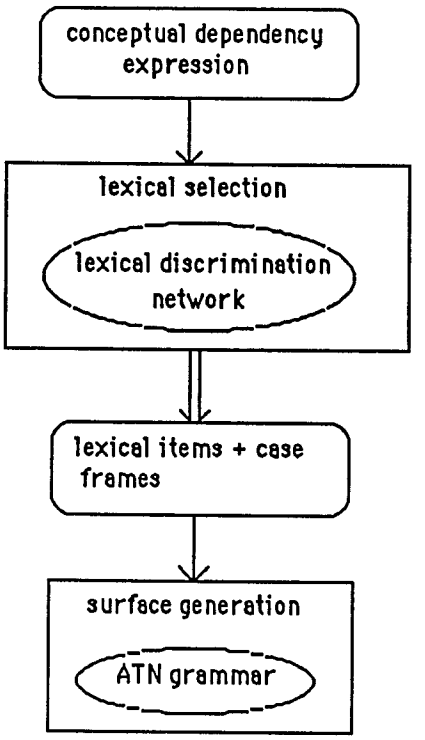


Fig. I-14: Generation in BABEL

It is important to note that Goldman adopts the approach of doing lexical selection before the grammar is traversed: ideational lexis, including transitivity seen from lexis, is distinct from and precedes grammar. In this respect, Goldman's model is more like Dik's (1978, 1987) Functional Grammar than like systemic lexicogrammar. Functional Grammar starts with the selection of predicate frames from the lexicon and these then pass through the syntactic and pragmatic components of the model.

The innovation in BABEL is the use of the discrimination networks for lexical selection. For example, processes of ingesting food, air, smoke, etc. are discriminated step by step in a taxonomy (cf. Fig. II:4-13 in Chapter II): first 'take' is distinguished as ingesting for the purpose of becoming healthier, next the ingesting of fluids or objects is distinguished from the ingesting of gas; 'smoke' is distinguished from 'inhale' and 'breathe', and so on; the discriminations continue until individual senses such as 'inhale' and 'take' have been reached.

Subsequent generation systems have not handled lexical selection along Goldman's lines, but his work still has both theoretical and practical interest. It can serve as an illustration of an approach to lexis in generation that has some of the properties of systemic lexis: both are based on the thesaurus model of lexis rather than the dictionary model. Further, it is very easy to rerepresent the distinctions made in Goldman's lexical discrimination nets by means of a system network, since discrimination networks are a special case of system networks. These matters will be taken up again in Section II:4.

Meehan's TALE-SPIN. The mid 1970s also saw the first story generator, Meehan's (1977) TALE-SPIN. Here is an example of a TALE-SPIN story:

> Once upon a time George ant lived near a patch of ground. There was a nest in an ash tree. Wilma bird lived in the nest. There was some water in a river, Wilma knew that the water was in the river. George knew that the water was in the river. One day Wilma was very thirsty. Wilma wanted to get near some water. Wilma flew from her nest across a meadow through a valley to the river. Wilma drank the water. Wilma wasn't thirsty any more.

It is, of course, easy to see how this text could be improved by giving TALE-SPIN better resources for creating clause complexes, ellipsis, reference, and so on; but the main emphasis was on the earlier stages of the generation process including the plot. Work on story generation has continued, but it has remained fairly distinct from work on other kinds of text. This is, I think, partly because it has been associated with a distinct school in artificial intelligence / natural language processing -- Schank's Yale school. But it is also because stories constitute a register that is fairly different from those normally attempted in text generation, all of which are non-fictional. For example, the need to create a plot is of particular importance in story generation. The differences between story generation and other kinds of text generation are of interest since they illustrate the need to base work on text generation on some theory of register so as to be able to relate the general notion of text to particular kinds of texts such as stories, reports, transcripts, and definitions.

Clippinger's Erma. Clippinger's (1978) work from the mid 1970s is of interest for a number of reasons. He took the task of simulating natural text production very seriously. He built a system intended to simulate a patient in a psychoanalysis situation, drawing on the analysis of natural transcripts. He built a system of independent modules, but designed it in such a way that feedback and interruption could take place. Influenced by Winograd's work, he originally intended to make direct use of Halliday's systemic-functional grammar. However, instead he developed a grammar that resembles systemic grammar in certain important respects but is an independent development. One reason for not making direct use of systemic-functional grammar was that Halliday's

work did not make contact with the conceptual level Clippinger needed to operate with. This seems to me to be a matter of stratification and interfaces rather than a conclusion about the usefulness of systemic-functional grammar in text generation.

Mann & Moore's KDS. In the late 1970s, Mann & Moore (1980) built a text generator known as KDS, which stands for knowledge delivery system, at the Information Sciences Institute. The name indicates one of the reasons for interest in having a text generation capability. It can serve to present, in natural language, information stored in the computer that would otherwise not be accessible to somebody without computational expertise. One of the strengths of the KDS system was that it included a reader model (cf. Figure I-1) that enabled the system to filter out information that could be assumed to be previously known to the reader; this model simply consisted of a list of facts. The grammar of the KDS system was a weak link and this led to the decision to develop a general and linguistically motivated generation grammar. Of all the various grammatical frameworks considered, systemic functional grammar was chosen, partly on the strength of Davey's Proteus system. The result was the Nigel grammar, which was the starting point in the next generation project at the Information Sciences Institute, the Penman project (see Section I:3).

McDonald's MUMBLE. One of the ways of ensuring generality in an approach to text generation and the possibility of applying the same generator to a variety of generation purposes is to isolate the components that can be reapplied. McDonald (1980) made a significant contribution towards this research goal by demonstrating how the same grammar could be used for

different generation tasks and with different kinds of knowledge representation. One significant later application is in scene description, reported on e.g. in McDonald & Conklin (1982).

MUMBLE has a long history of development, described in Meteer et al. (1987). As already suggested, McDonald was influenced by his teacher, Terry Winograd; the grammar can be said to belong to what we might call the systemic-functional 'family' of grammars. The current version, MUMBLE-86, and the Nigel grammar are now being distributed to the research community as resources to be included in various systems.

McKeown's TEXT. One of the important moves towards the generation of extended text was made in the early 1980s by McKeown (1982), at a time when several of the current lines of research into text generation were started, including the work on the Penman system. McKeown gave her system, which was called TEXT, a rhetorical component, which had the resources to support text-organization that was not a direct translation of the organization of the information in the knowledge source. Here is an example of a definition generated by TEXT; it will give a sense of what a generation system is capable of (ONR = Office of Naval Research; DB = data base):

```
[1] A guided projectile is a projectile that is self-
propelled. [2] There are 2 types of guided projectiles
in the ONR database: torpedoes and missiles. [3] The
missile has a target location in the air or on the
earth's surface. [4] The torpedo has an underwater
target location. [5] The missile's target location is
indicated by the DB attribute DESCRIPTION and the
missile's flight capabilities are provided by the DB
attribute ALTITUDE. [6] The torpedo's underwater
```

```
capabilities are provided by the DB attributes under
DEPTH (for example, MAXIMUM OPERATING DEPTH). [7] The
guided projectile has DB attributes TIME TO TARGET &
UNITS, HORZ RANGE & UNITS and NAME.
```

Having these rhetorical strategies was crucial since the knowledge source of the system was a navy data base which had not been built to support text generation. The method of translating directly from the knowledge source would not have produced very good text. McKeown's work on rhetorical organization is highly relevant to the present discussion for two reasons. First, it contrasts in interesting ways with Rhetorical Structure Theory, a theory of text organization developed within the Penman project. Second, it is similar in some important respects to Hasan's (1978, etc.) Generic Structure Potential in systemic theory. (McKeown's work is discussed in relation to systemic theory and Rhetorical Structure Theory in Matthiessen (1988).)

Another important aspect of TEXT is that it controls the selection of discourse topic (by means of the so-called focusing mechanism). It uses this control both in selecting what to say and in influencing decisions within the grammatical component.

McKeown's sentence generator is also of interest here. Its grammar is of the kind developed by Martin Kay (1979), a Functional Unification Grammar (FUG), which, as already mentioned, resembles systemic-functional grammar in many respects and is part of the systemic-functional family of grammars (cf. Winograd, 1983: Ch. 6). McKeown selected the framework because of its functional nature: "It was selected because of the ability to directly encode in the grammar tests on focus and theme for determining which construction to use,

information which the strategic component supplies for this purpose." (McKeown, 1982: 210) In this respect, FUG is like systemic functional grammar.

The figure below diagrams the overall organization of TEXT. It is based on McKeown (1982: 16) and adapted to maintain comparability with the design sketch in Figure I-3.

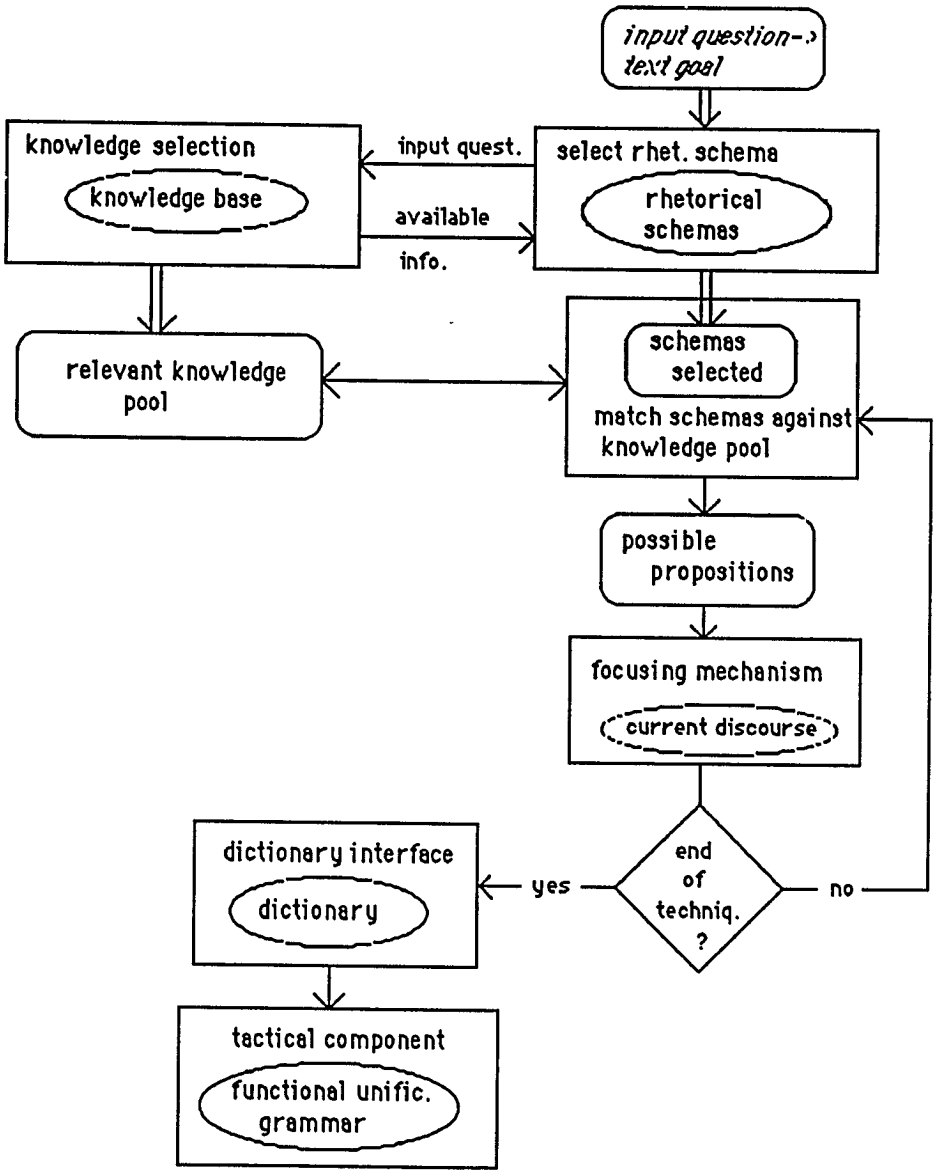


Fig. I-15: Generation in TEXT

McKeown (op cit., p. 14-15) summarizes the procedure for generating text as follows. Assume that we have asked the system a question such as "What is guided?". In response to the input question, semantic processes in the system produce a relevant *knowledge pool.* For example, if the task is to define an object, such as a guided projectile, this search for knowledge identifies "the area around the questioned object containing the information immediately associated with the entity (e.g. its superordinates, sub-types, and attributes)". Next, *rhetorical selection* takes place:

> A characterization of the information in this [knowledge, CM] pool is then used to select a single partially ordered set of rhetorical techniques from the various possibilities.
>
> A formal representation of the answer (called a 'message') is constructed from the relevant knowledge pool which matches the rhetorical techniques in the given set.

To guide the selection of what to say next, the system uses a focusing mechanism (based on Grosz's (e.g. 1978) work on focus and focus spaces). This is really a mechanism for selecting the next *discourse topic* (rather than focus in the sense the term usually has in linguistics) by consulting a model of the current discourse:

> The focusing mechanism monitors the matching process; where there are choices for what to say next ..., the focusing mechanism selects that proposition which ties in most closely with the previous discourse.

The ordered messages that come out of the generation process as described so far (knowledge selection, rhetorical schema selection, and topic selection -- what McKeown calles the strategic component of the generator) are lexicalized in the dictionary interface before they reach the grammatical component:

> The dictionary stands as interface between the strategic and tactical component. Input to the dictionary is in message formalism; the dictionary takes a single proposition as input which consists of a predicate and its instantiated arguments ... Dictionary output is the deep structural representation for the English sentence to be generated, specified in Kay's (1979) functional notation ... (op cit, p. 192)

McKeown calls the output of the dictionary interface a deep structural representation. Alternatively, we can interpret it in terms of systemic theory as ideational lexis, including transitivity configurations. The tactical component contains other aspects of lexicogrammar and these are unified with the output of the dictionary interface:

> Once the message has been constructed, the system passes the message to a tactical component (Bossie, 1981[17]) which uses a functional grammar (Kay, 1979) to translate the message into English. (p. 15) A sentence is produced in Kay's formalism by unifying the input, which is specified in the same formalism as the grammar, with the grammar. The input to the unifier is a deep structure representation of what is to be generated. The output is a surface syntactic representation of the sentence which is linearized using the patterns it contains. (p. 219)

Note that, as in the BABEL generator, lexical selection takes place before the 'tactical component' is entered. In contrast with BABEL, both the dictionary interface and the syntax operate with the same formalism -- functional unification grammar.

The framework of rhetorical schemas has been used in other generation system: see Kukich's (1985) stock market report generator ANA. The texts generated by McKeown's TEXT system are concerned with object-oriented

[17] The work referred to does not seem to have been written up at the present time of writing.

fields -- the properties, parts and types of vessels and other objects in the navy world. Recently, Paris has extended the framework to deal with descriptions of mechanisms, see e.g. Paris & McKeown (1987).

Two recent text generation projects of particular interest in the present context are described in Bateman et al. (1987) and Patten (1986). Bateman has built a systemic grammar of Japanese as part of a Japanese text generator.

Patten has added a systemic semantics to an adaption of an earlier version of the Nigel grammar (cf. Section III:6).

Most work in text generation has focussed on controlling the ideational metafunction of language -- language as representation of experience -- and the other metafunctions, the interpersonal and the textual ones in systemic theory, have received much less attention. Two recent exceptions to this are Bateman's exploration of the interpersonal and textual metafunctions in Japanese and Hovy's (1987) generator Pauline, which is designed to take interpersonal factors into consideration so that it can generate different texts on the same 'topic' for different readers.

2.3 Differences in text generator designs

As already remarked in connection with the overview of a text generation system in Section I:1.2, existing text-generators vary considerably in design. They can be compared and contrasted in terms of the techniques they use and

the resources they rely on. For example, Mann (1981) compares and contrasts Davey's Proteus with his and Moore's KDS system. He concludes that the two generators "have very little in common". Similarly, Kempen (1987) notes that the architectures of the generation systems he surveys are quite diverse.

As further examples of differences in design, consider the following instances from generators, some of which were presented above.

"KDS has sentence scoring and a quality-based selection of how to say things; PROTEUS has no counterpart", but on the other hand, "PROTEUS has a sophisticated grammar for which KDS has only a rudimentary counterpart" (Mann, 1981).

Appelt's (1985) KAMP system emphasizes the use of the goal-pursuit paradigm in generation, but Swartout's (1983) GIST Behavior Explainer is not goal driven.

Jacobs' (1985) PHRED is strong in the representation of lexical and idiomatic information but does not produce rhetorically organized multi-sentential text.

McKeown's (1982) TEXT system has a real facility for discourse organization, but there is no reader model that could be used to determine what not to say depending on what the reader already knows.

Mann & Moore's (1980) KDS system has a simple reader model, but its grammar is "rudimentary".

Generators use different kinds of knowledge sources. Some systems use a database, others use a more structured knowledge base, while yet others explain an execution trace from the operation of an expert system.

In Sowa's (1983a,b) design for grammatical expression, a conceptual (semantic) structure is translated into a grammatical one, while the Nigel interface is paradigmatically organized.

This list of differences is indicative of the present state in work on text generation. Each good system makes a specific contribution in some particular area, such as grammar or text organization, but there is no system that integrates all the significant contributions that have been made and shows strengths in all areas.

In 1980, McDonald (1980: 32) identified two "schools" in text generation work, "one school that we could term 'grammar-controlled linearization and translation'" (e.g., Simmons & Slocum, 1972; Goldman, 1974; Heidorn, 1972; and Shapiro, 197) and "another, larger if less linguistically sophisticated school that we could term 'production directly from data'" (e.g. some expert system explanation). Since McDonald made this distinction, the question of whether a generator makes use of an independent rhetorical component has also emerged more clearly as an important consideration: one line of work in text generation has focussed on sentence generation, while another development

also includes text organization.

2.4 Register and text generation

Different designs clearly reflect different concerns and preferences on the part of researchers, but there is another significant reason for the variation. Different registers tend to lead to different kinds of designs (cf. Section I:1.2 (iii)). Story generation and expert system explanation constitute fairly distinct lines of research in text generation. Furthermore, text-generators have often been one-register generators -- game transcript generators, story generators, stock market report generators, and so on -- and this has made certain design simplifications possible. For example, some systems have been designed for registers where it is possible to achieve results without generating text extending beyond a sentence (cf. Appelt, 1983; Jacobs, 1985).

Other systems have generated extended text but have relied on the organization of the domain or field to organize the text rather than on an independent set of rhetorical strategies. Thus we find systems that will just trace through procedures such as computer programs and 'translate' them into English -- a method sometimes called direct translation or direct replacement (see Swartout, 1983; Kukich, 1983; and McDonald, 1986 for some discussion).

Another approach for a generator working in a restricted register is to rely more heavily on lexis than on grammar by using a so-called phrasal lexicon, as

in Kukich's (1983) stock market report generator, which uses lexical items such as *display a hesitant mood early in the day* and *display a hesitant mood late in the day.*

The limiting cases are extremely restricted registers, Firth's restricted languages, where it is possible to use what has come to be known as "canned text", quoted messages that appear under certain conditions, instead of a text generation facility.

I will now turn to the project that provides the immediate context for my discussion, the Penman project.

3. The Penman project

The Penman project started around 1979/80. It was a continuation of a research effort into text generation led by Bill Mann. I will mention aspects of the work on the project that relate to systemic linguistics. In the remainder of the thesis, I will then take up some of these topics in more detail.

3.1 Development of the Nigel component

The first part of Penman to be worked on was **the systemic grammar** *of the Nigel component.* The original version of it was provided by Michael

Halliday in the summer of 1980. The framework was close to the version of systemic grammar worked out earlier by Halliday (1969, 1970). Although there have been some additions, the basic framework has remained the same; a description of it is given in Chapter II -- for accounts, see also e.g. Mann (1983), Mann & Matthiessen (1985), and Matthiessen (1983a). The description encoded in the framework was a clause grammar of English consisting of about 80 systems. Since then, we have worked with the help of Halliday and other systemic linguists to extend and revise the clause grammar and add clause complexes, nominal groups, prepositional phrases, and so on. The grammar now consists of 600 - 650 systems. It is a large grammar by computational linguistic standards; it may be the largest generation grammar of any language.

One of the first questions was how to relate the grammar to a **lexical model**; I presented an early design in Matthiessen (1981). The work on the lexicon for the Nigel grammar has since been carried out by Susanna Cumming (Cumming, 1986b). Although it has a hierarchic organization, the lexicon is not a systemic one and I will not discuss it here. Instead, I will explore the possibility of developing a systemic lexis as an addition to the grammar.

Another early need was to create a framework that could control the grammar in a purposeful way and relate it to other parts of the planned generator. In 1981, we worked on a sketch of a semantic interface for the systemic grammar, the **chooser and inquiry framework**; discussed in Chapter II -- see further Mann (1982) and Matthiessen (1981, 1983, 1987a); and also Nebel & Sondheimer (1986) on the formal interaction between inquiries and the knowledge base of the generator. We have built up the interface for the whole

grammar. One of the side-effects of this work was a presentation of the semantics of English tense where I used systemic grammar and the chooser and inquiry framework (Matthiessen, 1984).

Since its beginnings, the Nigel grammar has been a systemic generation grammar. A more recent development is Bob Kasper's (1987a, 1987b/1988) work on extending the generation grammar into a **parsing grammar**. This will obviously increase the usefulness of the Nigel grammar quite significantly and it will provide researchers with a functionally oriented parsing grammar. The strategy Kasper has chosen is to translate the systemic functional grammar into a functional unification grammar, since there has already been a good deal of work on how to parse with that framework. One additional benefit of his translation is that it has shown in detail how systemic functional grammar and functional unification grammar are related and he has identified an area where functional unification grammar needs extending: it needs conditional descriptions to represent conditional entry conditions in the system network of a systemic grammar. The work on this representational issue in functional unification grammar falls outside the scope of the present discussion; Kasper (1987, 1988) provides a detailed account.

3.2 Development of components outside Nigel

We can see Nigel as an independent module embedded in the Penman generator. Thanks to its chooser & inquiry interface, it is designed in such a way

that it can also be embedded in other generation systems and the move to carry out experiments in this direction has just started. From the point of view of the Nigel component, the rest of the generation system it is embedded in can be seen as its environment, as noted in Section I:1.1 (cf. Figure I-2). The environment consists of a knowledge base as well as various planning components. Nigel's environment is being organized partly to address the demands Nigel makes on it. To answer the inquiries presented by Nigel's chooser and inquiry interface, Nigel's environment needs the information to support the responses to the inquiries.

To find responses to ideational inquiries, it was necessary to specify the general organization of the **knowledge base**. In 1985, drawing on his interpretation of English grammar, Michael Halliday and I drafted a general ideational semantics, known as the *Bloomington lattice,* to be used as a guide for a 'conceptual' taxonomy in the knowledge base. The question we addressed was what contextual support the ideational part of a grammar needed in a text generation system. I will touch on this work in Chapter IV; see also Halliday & Matthiessen (in prep.) and Matthiessen (1987c). The Bloomington lattice has been used as an aid in modelling two domains in the knowledge base, an electronic mail and calendar (correspondence and diary) domain and a navy domain.

When the work on the Penman generator started, there was no general theory of **text organization** or part of text organization in use in text generation. Generators either did not include any strategies for organizing text or used strategies that did not generalize in any obvious way to new generation tasks. In 1982, Bill Mann, Sandy Thompson, and I began to work on an analytic

framework for text organization to be turned into a constructive one for text generation. Bill Mann and Sandy Thompson developed the framework into *Rhetorical Structure Theory* (RST; Mann and Thompson, 1987; Mann, 1984) and started to design a constructive version of it with the help of Cecilia Ford (Mann and Thompson, 1987; Ford, 1987). A constructive version of RST based on the paradigm of hierarchic planning in AI is now being developed by Ed Hovy (see Hovy, 1988). While RST is not a systemic theory of text organization in the sense of being a direct continuation of systemic work, it was influenced by the work of Ruqaiya Hasan and Jim Martin. I will return to RST briefly in Chapter III.

In addition to the component for planning the rhetorical organization of the text, it is also necessary to design components to create plans for grammatical units such as clauses and nominal groups: Peter Fries has designed a **nominal group planner** for the Penman system with my assistance. Previous nominal group planners focussed only on the need identify referents unambiguously. We have treated that concern more as a 'safety check' than as a driving principle; the main task is to characterize a referent according to the role it plays in the text. Fries' planner is also sensitive to e.g. text organization and the role a particular nominal group plays in the discourse; for some discussion see Fries (1987). Part of the nominal group planner has been implemented by Richard Whitney; much work still remains to be done. Recent work on lexical selection by Sondheimer, Albano & Cumming (1988) is strongly related to the concerns of the nominal group planner.

4. The exchange with linguistics

Text generation has drawn on AI and computational linguistics as well as linguistics. I think linguistics has more to offer than has been made use of to date. At the same time linguistics can benefit from work on text generation. To expand the exchange between linguistics and text generation, we need to identify what linguistics has already contributed and what are further possible exchanges.

4.1 What products has linguistics contributed?

We can think of a design such as the one diagrammed in Figure I-1 as a shopping list for the researcher in text generation. The distinction between resources and processes is significant since it has tended to determine what is taken from linguistics and what is taken from artificial intelligence and computer science: linguistics has provided text generation with models of resources rather than accounts of processes; process models have been taken primarily from computational linguistics and artificial intelligence.[18] There is also a tendency to rely more on linguistics in the area of the grammatical 'core' of the linguistic system:

[18] Text generation research has drawn on knowledge representation in artificial intelligence and computational linguistics for the knowledge base rather than on linguistics. However, Fillmore's case grammar provided important input into knowledge representation; see e.g. Samlowski (1976).

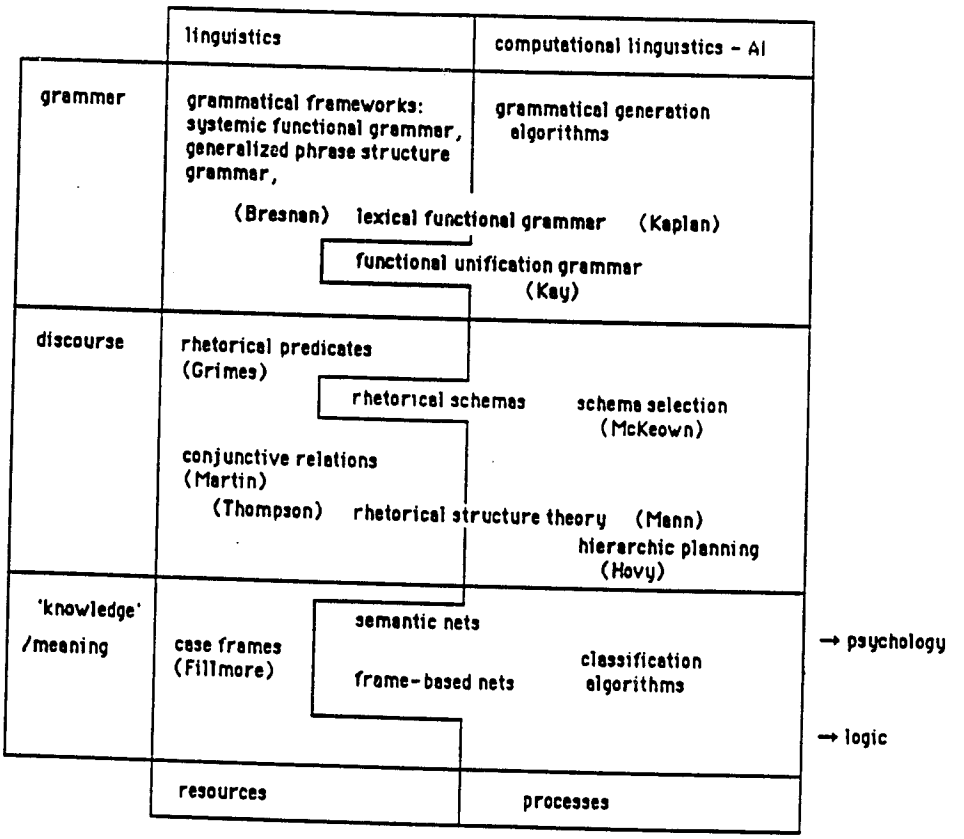


Fig. I-16: Contributions from linguistics to areas relevant to text generation

Specific examples from text generators include the following.

Both Davey's (1978) Proteus generator and the Penman generator include grammars taken from systemic linguistics, but the generation algorithms were not taken from systemic linguistics.

Granville's (1983) model of lexical substitution in generation is derived from Halliday & Hasan's (1976) work on cohesion.

In her development of rhetorical schemas, McKeown (1982) used Grimes' (1975) work on rhetorical predicates, but in her implementation of a process for using them she used transition nets from computational linguistics.

What can we learn from the past application of linguistic work in text generation? From the picture I have sketched it is clear that there is a gap in linguistic theory building: there are few process accounts in linguistics. Martin (1985) identifies this gap and suggests that it is necessary to operate with dynamic models as well as synoptic (static) ones:

> Having argued for the importance of both a synoptic and a dynamic perspective on two very different semiotic systems, genre and bridge, the question naturally arises as to whether these two perspectives are relevant to language as well. The answer that most linguists have implicitly given since Saussure is *no;* a synoptic perspective has almost exclusively dominated linguists' work on phonemes and clauses. Now that linguists have begun to turn their attention to texts, however, the answer is no longer so simple. (p. 260) ... much of the difficulty linguists have experienced in text generation probably stems from the importance of dynamic systems in this enterprise. Linguists come to discourse equipped with synoptic generative models, not dynamic ones. (p. 272)

There is, then, a clear need to explore dynamic models in linguistics. One step in this direction is to interpret the relevant work in computational linguistics and AI in terms of linguistic theory. For instance, how do the grammatical generation algorithms used in text generation systems relate to the categories of grammatical theories?; what kind of theory of text organization does hierarchic planning in AI presuppose?; and so on. This move towards more dynamic models is a long-term project. I will only make some observations concerning the generation algorithm in Sections II:1.2.1.6 and III:4.5.

The past exchange between text generation and linguistics indicates another area where expansion is needed in linguistics. Work on knowledge representation has come almost entirely from computational linguistics and AI but we need to supplement this with linguistic accounts. As with dynamic models, one step in this direction is to interpret what has already been done in terms of linguistic theory; I will take this up in Chapter IV. It might be argued, of course, that 'knowledge' lies outside language and is a matter for cognitive psychology rather than linguistics. But linguistics can make a contribution by providing an alternative metaphor for knowledge, i.e. an alternative way of looking at knowledge: knowledge is meaning; or rather, the information looked at as knowledge can also be looked at as meaning. Therefore, language can give us insights into how it is organized.

Related to the separation of knowledge from language is the separation of thinking from semantic processing. For example, Levy (1979) contrasts what he calls a text-based approach to communication[19] with the mind-based

[19] He attributes the text-based approach to Halliday and Hasan, citing from their work on

approach he explores. He focusses on speaking as mental activity:

> Cohesion, I will argue, is most certainly REALIZED THROUGH the speaker's language resources, but its ultimate reference point must be found in the structure of the linguistic content and in the flow of the speaker's thought processes. ... The central thesis of this chapter is that the study of discourse must come to terms with the mental activity of the speaker, that it must make reference to the processes in which he is engaged while speaking. I will attempt to show that the speaker encodes important components of his thought processes in his utterance (the very thought processes that lead to the production of that utterance). ... I will argue that much of the cohesive properties of discourse [footnote omitted] are best captured by reference to the speaker's mental states and that the current research on text grammars is not only mistaken (as Halliday and Hasan imply) by imputing structure where there is none but also that it is working at the wrong level of description to capture the salient generalizations. (Levy, 1979: 184-5)

As Levy points out, his 'mind-based' perspective comes from AI, but we also find it in linguistics. For instance, we find it in 19th century and early 20th century grammarians in notions such as psychological subject and psychological predicate and it has recently become more popular again in linguistics. But the mind-based approach to communication is much more wide-spread: Whorf (1939/56) pointed out many years ago that it is the common-sense model of language and thought, what he called natural logic --

> Natural logic says that talking is merely an incidental process concerned strictly with communication, not with formulation of ideas. Talking, or the use of language, is supposed only to "express" what is essentially already

cohesion (Halliday & Hasan, 1976), but this is a misunderstanding (cf. Fries, 1986, for a discussion in the area of reading), since they have always emphasized not only text but rather text in context, a perspective which goes right back to Malinowski (e.g. 1923): their model is based on text in context. It is also important to emphasize that text is the actualization of the system behind it (see e.g. Halliday, 1977) and that systemic linguistics has never focussed on one to the exclusion of the other. Further, it should be emphasized that text is a high-level semantic process.

> formulated nonlinguistically. Formulation is an independent process, called thought or thinking, and is supposed to be largely indifferent to the nature of particular languages. (Whorf, 1939/56: 207)

The mind-based approach of AI is arguably an embodiment of the common sense view of natural logic. Whorf pointed to two fallacies in natural logic, both of which arise because language is usually backgrounded to the task at hand in communication and so outside "critical consciousness":

> First, [natural logic] does not see that the phenomena of language are to its own speakers largely of a background character and so are outside the critical consciousness and control of the speaker who is expounding natural logic. Hence, when anyone, as a natural logician, is talking about reason, logic, and the laws of correct thinking, he is apt to be simply marching in step with purely grammatical facts that have somewhat of a background character in his own language or family of languages but are by no means universal in all languages and in no sense a common substratum of reason. Second, natural logic confuses agreement about subject matter, attained through use of language, with knowledge of the linguistic process by which agreement is attained: ... (op cit., p. 211)

Whorf suggests that agreement between two people can only be attained through the "amazingly complex system of linguistic patterns and classifications" which they share. They reach agreement by linguistic processes or else they fail to agree.

As an alternative to the position of natural logic, Whorf emphasized the importance of linguistic processes:

> ... the background linguistic system (in other words, the grammar) of each language is not merely a reproducing

> instrument for voicing ideas but rather is itself the shaper of ideas, the program and guide for the individual's mental activity, for his analysis of impressions, for his synthesis of his mental stock in trade. Formulation of ideas is not an independent process, strictly rational in the old sense, but is part of a particular grammar, and differs from slightly to greatly, between different grammars.

The contrast between the two positions Whorf identified is important in the development of text generation systems since the different positions lead us to look for guidance from different sources in designing the systems. If we pay attention to the alternative Whorf suggests, it follows that linguistics has a central role to play in creating models of 'knowledge' as well as of the processes of creating text. That is, it can and should do more than supply the components for expressing the flow of thought.

Since Whorf made these observations, other aspects of the 'background' system have come into focus in linguistics, notably semantics and rhetoric and their interaction with context, and it is functional linguistics that has served to expand the territory.

4.2 What can linguistics offer?

In addition to making continued contributions in the areas where linguistics has already contributed to work on text generation, how can linguistics make new contributions? I think it is fair to say that computational linguistics has paid considerably more attention to formal linguistics than to functional linguistics.

The area where linguistics has made the largest contribution is grammar (i.e, syntax and morphology), which is also one of the main areas of formal linguistics. Areas that lie beyond the horizon of formal linguistics have received much less attention. Consequently, I think many of these areas contain ideas that are important to the development of text generation and which functional linguists interested in making contributions might focus on. For example:

Context. Text is produced in context and linguistically motivated theories of context can complement current work. For instance, more sophisticated generation systems will have to make purposeful choices reflecting the **tenor** of the social relationship between writer and reader or speaker and listener.

Register. Future text generation systems will have to move from being generators of particular kinds of text such as stock market report generators or game transcript generators to being more flexible systems, systems with broader registers. To accomplish this, we will need theories of functional dialect / register / genre: we need theories that relate the general task of text generation to specific tasks of generating specific types of text.

Semantics (functional). Semantics in text generation has almost always meant a fairly formal kind of semantics. Functional semantics can contribute towards the problem of relating communication tasks identified by a text generator and lexicogrammatical resources.

Multifunctionality. There has undoubtedly been a bias towards the ideational function of language -- a bias towards 'getting the content' right. Functional linguistics can make contributions from the **textual** and **interpersonal** functions.

These are very general observations and it is possible to add others -- for example, a functional organization of lexis as a resource. But it is also important to add more detail and identify detailed contributions. I will address this need throughout the dissertation.

In view of the tendency to draw on linguistics for resources but not for process models, it is natural that my discussion should focus on resources rather than on generation processes. But, at the same time, the interpretation of the processes in terms of linguistic theory is an important task to which I will pay attention.

4.3 Complementarity

We might argue that the picture presented in Section I:4.1 represents the appropriate complementarity between linguistics and computational linguistics / artificial intelligence in the area of text generation. I have already suggested that it does not. On the one hand, linguistics already has more to offer than has been consumed up to now. On the other hand, there are gaps in linguistic theory and description that need to be addressed.

To sum up, I don't think that the complementarity between linguistics and computational linguistics / AI lies in complementary partial coverages of the whole of text generation. Rather, I think the complementarity should lie in abstraction. We have to build complete linguistic models of text generation but these will be more abstract than their computational counterparts. It is of crucial importance to operate at various levels of abstraction; abstract linguistic models of text generation are essential in maintaining a broad exchange. They will serve to help interpret experience in computational linguistics / AI with processes, knowledge representation, and so on for linguistics so that we can learn from this experience. And, looking in the other direction, they will serve to relate work in linguistics that has not yet had an impact on text generation to work in computational linguistics / AI. In short, we need to operate with full coverage at various levels of abstraction so as to create interfaces in the exchange. For instance, linguistic descriptions of processes can be used as abstract specifications for computational processes.

4.4 Feeding back into linguistics

There are also important reasons internal to linguistics for exploring linguistic models of text generation. These models will complement the analytic mode of study used in discourse analysis and other areas. Text synthesis can come to have the same value in linguistics in general as speech synthesis has had in phonetics. The value of text synthesis lies at least at three levels.

(i) The task of text synthesis raises new questions for linguistics or serves to foreground questions that are not normally very central. For instance, if we are to develop a linguistic grammar for generation, we have to face questions concerning grammatical processes in generation (cf. Section II:1.2.1.6). Further, text synthesis invites us to adopt a very broad notion of functional explanation. Functional explanation is often almost exclusively the explanation of grammatical structure in general; in text synthesis, we have to give functional accounts capable of handling instances of grammatical choices in the synthesis of a particular text as well.

(ii) The incorporation of linguistic answers to the questions raised by text synthesis is an opportunity to test them. For instance, since the resources in a text-generator are all used by automatic processes, they have to be explicit, detailed, and nonambiguous to a degree that is not normally required in linguistics. This raises interesting representational issues: cf. Section II:3 and Matthiessen (1987b).

(iii) Finally, once we have a working text generator we can learn from the text it synthesizes by diagnosing the problems that arise and solve them by adjusting linguistic theory and description. A simple example would be a 'story' of the kind produced by Meehan's TALE-SPIN, quoted earlier; cf. further Section II:2.3.2.

Although I will touch on the third level, I will focus on the first two. The more Penman develops, the more we will be able to address the third level.

4.5 Choosing systemic linguistics

In Sections I:2 and I:3, I gave a rough characterization of the text generation task first by identifying the major research tasks that have been identified up to date and then in terms of an abstract sketch of the processes and components of a mid 1980s text generator. Now I can turn to the choice of a linguistic theory that can contribute towards work on text generation. It might be argued that the idea of choosing *one* theory is a bad one to start with; that we may be much better served if we pick and choose from a variety of sources as we assemble a text generator. However, I think there are good reasons to use one theory, at least as a reference point:

(i) there is a greater likelihood of compatibility among the parts if they come from the same theory; and

(ii) we are likely to learn more about the value of one theory if we apply it uniformly.

Although these are, I think, good and valid reasons, text generation systems do not, as a rule, apply one linguistic theory throughout. Perhaps the clearest exception is Patten's (1986) system which draws on systemic theory for both its grammar and its semantics; but his system does not generate extended text so it does not apply a theory of text structuring. In any case, I will use one theory as a reference point throughout my discussion, viz. systemic theory. I do not think that it is possible to argue conclusively for the choice of one theory over another

for the task of text generation; nor do I think that it is desirable. There is absolutely no reason whatsoever to think that there is only one possible approach to any application of linguistic theory. Moreover, experience with different approaches is extremely valuable. So, I will point to some reasons for choosing systemic theory as *a* theory, though not as *the* theory:

(i) tradition of exchange: there is a long history of systemics and computation in the area of grammar and it is thus possible to draw on previous work, such as Henrici (1966), Winograd (1972), and Davey (1978), and on work in the current community, including the work reported on in Bateman et al. (1987), Kasper (1987), and Patten (1986) and work by Robin Fawcett in Great Britain, Erich Steiner in West Germany, and Marilyn Cross in Australia. Further, some central ideas on lexical choice and discourse organization that have developed independently in text generation relate to systemic theory in interesting ways (cf. Section I:2.3).

(ii) theoretical comprehensiveness: if we want to choose one linguistic theory, there are, in fact, few linguistic theories that are comprehensive enough. That is, most current linguistic theories are not global theories of language -- much less theories of language in context -- but local theories, e.g. theories of syntax, syntax and morphology, or syntax, morphology, and phonology. These local theories do not cover semantics in a general way, discourse or discourse organization, cohesion, context, and register, all of which will be central to work on text generation. Tagmemics, systemics, and stratificational theory are probably the only three comprehensive theories with a long tradition of research in the English-speaking world of linguistics.

(iii) descriptive comprehensiveness: the current task is to generate English text, so descriptive coverage of English is an important consideration. Of the three theoretically comprehensive approaches just mentioned, systemics is clearly the most comprehensive in coverage of English. Tagmemics has tended to focus on other languages and stratificational linguistics has not produced comprehensive accounts of English. Among formal theories of syntax, more value has been put on in-depth studies of particular areas of formal theoretical interest than on comprehensiveness.

(iv) paradigmatic orientation: in text generation, one of the central tasks is to exercise purposeful control, which calls for theories with a strong paradigmatic orientation. As already noted, systemic theory has a paradigmatic base -- the system network -- and structural realization is separated from this paradigmatic base. Most current theories of syntax, semantics, discourse, etc. emphasize syntagmatic organization and do not have a paradigmatic base: structures are generated by means of structural rules instead of being generated as realizations of paradigmatic selections. The paradigmatic organization represented by the system network of systemic theory is often implicit in the rules intended to specify syntagmatic possibilities. That is, while syntagmatic rules may be optional and include alternations, these instances of specifications of choice are all local and incidental to the syntagmatic specification; they are not explicitly related as a network of inter-related choices, which is what constitutes an independent statement of paradigmatic organization.

(v) functional orientation: if we take text generation to be purposeful behaviour and model it as goal pursuit, we need a theory with a functional orientation. More specifically, we need a theory that allows us to model language as a resource organized according to the functions it has evolved to serve.

(vi) theoretical research questions: there is obviously more theoretical pay-off in applying a theory if the application is likely to throw light on questions within the theory. This is the case with systemic theory, where current questions of research interest include dynamic modelling, the task of which is central in text generation, and the representation of context, which is related to issues of knowledge representation in text generation.

(vii) the exchange between theory and application: systemic theory has always been developed in the context of application; application has not been activity unrelated to the development of theory.

Halliday (1985: 1, 6) addressed the exchange between systemic theory and application in contribution to the Ninth Systemic Workshop:

> The theme of the workshop is "Applications of Systemic Theory", and this suggests to me that it is in the context of what can be done with the theory that we shall be seeking to exchange ideas. The theory has evolved in use; it has no existence apart from the practice of those who use it. Systemic theory is a way of doing things. If the English language permitted such extravagances I would name it not with a noun but with an adverb; I would call it 'Systemically'. ... These very sketchy references will perhaps serve to bring out what I think is a salient feature in the evolution of systemic theory: its

> permeability from outside. By 'outside' I mean not only outside itself, from other theories of language such as tagmemics and stratification theory, but also from outside linguistics, from disciplines for which language is not the object of study but rather an instrument for some other purpose ... The value of a theory lies in the use that can be made of it, and I have always considered a theory of language to be essentially consumer-oriented.

There is an important analogy between linguistic theory -- metalanguage -- and language here: both develop to serve the uses to which they are put. A functional theory of language is designed to bring out the ways in which language is organized according to functional principles; it is also a ***'meta-functional' theory*** in the sense of being organized to serve the uses to which it is put.

The general considerations just presented will be illustrated at a higher and more useful degree of specificity throughout the dissertation.

5. Organization of the rest of the thesis

I will now proceed upwards in terms of the stratal model discussed in Section I:1.2 above:

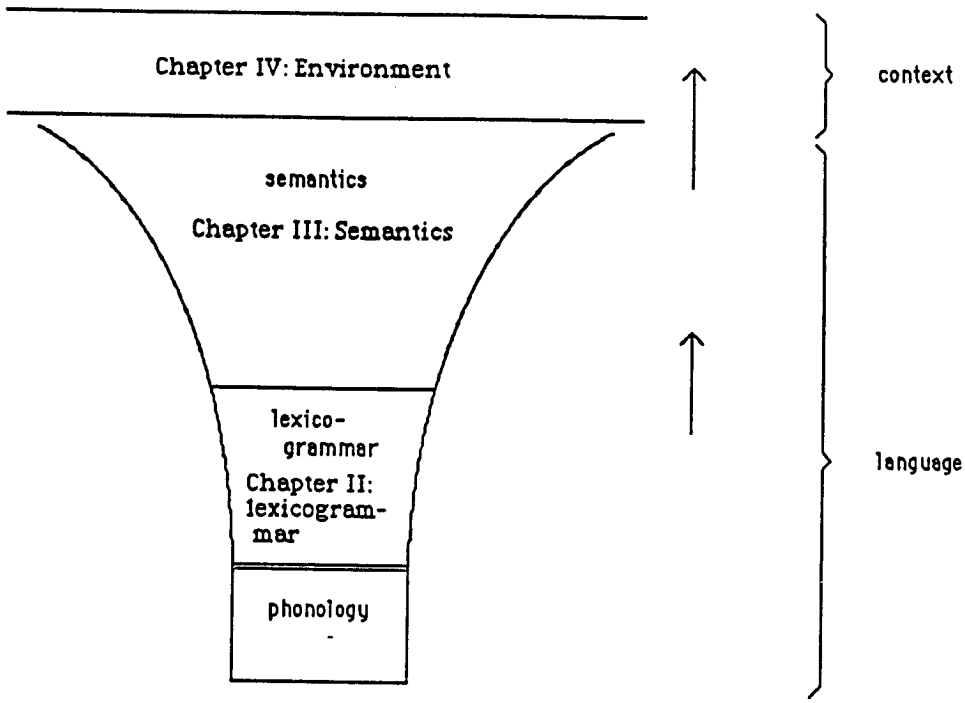


Fig. I-17: Stratal organization of the thesis

Chapter II deals with lexicogrammar, starting with the particular demands on lexicogrammar in text generation (Section II:1:1) and moving on to the basic grammar embodied in the Nigel component of the Penman system (Section II:1.2). After this discussion of the framework, I will address questions concerning the descriptive coverage of a text generation grammar (Section II:2). This section will also serve to present some aspects of systemic description of English needed in the subsequent discussion. In Section II:3, I turn to problems with and extensions of the basic grammar presented in Section II:1. I continue

the discussion of extensions of the basic grammar in Section II:4, now in the lexical area of lexicogrammar.

Chapter III deals with the stratum above lexicogrammar, the semantic interface to the environment of the lexicogrammar. In generation, the lexicogrammar has to be controlled in a purposeful way and this is the task of the grammar-based semantic framework known as chooser and inquiry semantics. The semantics works by presenting inquiries to the environment of the grammar and its semantics and acts according to the responses. This chapter starts with a brief characterization of the basic framework (Sections III:1 and III:2). Then I identify problems with the framework (Section III:3) and explore solutions, cast in terms of a network of inquiries rather than chooser packages, in two steps (Sections III:4 and III:5). In the next section (III:6), I depart from the grammar-based move upwards, I shift the point of view and look at the semantic interlevel from context instead of viewing it from grammar. Finally, I relate chooser & inquiry semantics to other approaches to semantics in work on text generation and in linguistics.

The responses to the semantic inquiries have to be supported by the environment and in Chapter IV I turn to the question of how it is to be organized. I suggested that we can organize it abstractly into an ideation base (Section IV:2), an interaction base (Section IV:3), and a text base (Section IV:4). My central concern is to explore what language can tell us about the internal organization of these bases, a mode of inquiry that contrasts with the approach of making a priori assumptions.

In broad outlines, the discussion is a journey from the lexicogrammar upwards and, within this overall organization, movements from the basic towards extensions. This journey is one of design; it runs counter to the direction of the process of generation itself. By and large, it reflects the development of the components of the Penman system. It is not hard to see the reason for the direction of the movement: we move from the reasonably well-known and well-described towards lesser-known territories.

But this movement has to be complemented by a movement in the other direction, one that takes context rather than lexicogrammar as its starting point. This complementary movement lies outside the thesis (except for some discussion in Section III:6); it is a sequel to it. This movement is needed not just because it documents the journey in the opposite direction but because it is really a different journey. For instance, we have to start with a theory of context rather than arrive at one from lexicogrammar and the two will not be identical.

6. Summary of Chapter I

In this chapter, I have introduced the notion of text generation and discussed it as a linguistic research task. I started by sketching a text generation system construed in computational linguistic terms. Then I turned to the linguistic theory I will use in the remainder of the thesis to address text generation as a linguistic research task; I gave a brief overview of the most relevant dimensions of systemic theory -- stratification, functional layering, functional variation, axis,

rank, and synoptic and dynamic perspectives.

Against this general background, I looked at some of the major text generation systems developed since the early 1970s and then at the Penman system in particular. If we are to develop text generation as a linguistic research task, we have to enquire into the complementarity and exchange between linguistics and computational linguistics (including AI work) in text generation; I made a number of observations in Section I:4.

CHAPTER II

LEXICOGRAMMAR

1. Theory

1.1 Demands on grammatical theory in generation

As I suggested in Chapter I, each application of a theory will raise a particular set of demands on it: different consumer demands can be met by different grammatical theories or different version of the same theory (cf. Halliday's (1964) notion of syntax and the consumer). Before describing how systemic lexicogrammatical theory is represented in Nigel, I will identify a number of ways in which the theory will be affected in the **context of text generation.** We can look at this context from three angles -- field, tenor, and mode. These are categories of the systemic theory of the context of language mentioned in Section I:1.2 above. But they are useful also in the consideration of the context of the systemic metalanguage. In fact, the notion of metalanguage invites us to borrow from linguistic theory when we have to do metalinguistic work.

Let me just gloss field, tenor, and mode briefly here. *Field* stands for the field of discourse -- the phenomena talked about. *Tenor* stands for the tenor of the relationship between speaker and listener -- how they are related in terms status, power, affect, and the like. *Mode*, finally, stands for the mode of the

interaction, e.g. whether it is spoken or written. In the context of text generation, these three variables can be characterized as follows:

(i) **field**: the grammar has to be organized as a resource for the rest of the system and the procedures for using it have to be specified; it has to be able to generate grammatical units in context;

(ii) **tenor**: the grammar has to be explicit, formal, and detailed so that it can be interpreted by a computer rather than only by knowledgeable grammarians; and

(iii) **mode:** the mode of representing the grammar has to be algebraic rather than graphic or discursive.

1.1.1 Field: paradigmatic resource, procedures & metafunction

The most significant demand on grammatical theory from field in text generation is that it should organize the grammar as ***a resource that can be controlled purposefully in the process of generating text.*** This means that the grammar should be organized so as to make it easy to build a semantic interface between it and the parts of a text generator that make use of the grammar. Ritchie (1985: 38) characterizes the problems in working on the semantic interface of a generation grammar. He suggests that the notion of autonomous syntax is not of current interest in text generation and continues:

> ... it is widely recognized that grammatical formalisms should have a well-defined interface between syntax and semantics. However, syntactic rules are still often described in terms of a *static* characterization of possible *structural combinations*, and the relationship between syntax and semantics is also a neutral statement of the content of these *structures* (see, for example, generalised phrase structure grammar, lexical functional grammar, and functional unification grammar). [My italics, CM.]

In other words, the interface in the kind of approach Ritchie identifies is only a syntagmatic one, focussing on "structural combinations"; it is an interface between semantic structure and syntactic structure and there is no paradigmatic interface. He goes on to note that in this kind of approach

it is not the task of the grammar-writer to consider where, how, or when the semantic decisions are made within the flow of generation (a similar comment might be made with respect to parsing). All the grammar-writer has to do is specify the possibilities, without regard to any direction of processing or source of decisions.

The problem Ritchie identifies is a very real one for a generation grammar: how do we turn a syntagmatically oriented generative grammar into a generation grammar?[1]

We can try to address the question in this form and it is instructive to see what happens: we are likely to need some kind of unified representation of ***paradigmatic organization*** over and above the syntagmatically oriented

[1] A generative grammar is, of course, neither a generation grammar nor a parsing grammar, which is why writers of generative grammars have not had to address issues of grammatical generation (as part of text generation).

rules to control the grammar. Systemic grammar is already paradigmatically based, of course; Sampson (1980: 228) draws attention to the contrast with transformational grammar in this respect:

> ... in a Chomskyan grammar the choice-points are diffused throughout the description, and no special attention is drawn to them. Many choices are made in the constituency base ... Other choices arise in applying transformations ... Often it will be the case that some choice in applying the transformational rules becomes available only if certain options have been selected in the constituency base, but a Chomskyan grammar does nothing to make such interdependences between choices explicit - that is not its aim.

It is particularly the statements of paradigmatic interdependences given independently of syntagmatic rules that do not usually occur in non-systemic frameworks.[2] From the point of view of a syntagmatically based syntax, the explicit paradigmatic organization may look like a 'higher level of control'. The work of Bates & Ingria (1981) on adapting a transformational grammar for controlled (as opposed to random) generation illustrates this and Sampson's observation referred to above. To achieve controlled generation with the transformational grammar, they added syntactic specifications at a higher level -- a 'higher level of control'; they report:

The transformational generator is composed of three major parts: a base component that produces base trees, a transformer that applies transformational rules to the trees to derive a surface tree, and a set of

[2] Kasper's (1987) work on translating a systemic-functional grammar into the functional unification framework has served to identify the need to enhance the latter to deal effectively with the complex entry conditions used in the system network representation of paradigmatic organization. Although the two frameworks are close in many respects, Kay did not focus on an independent representation of paradigmatic organization.

mechanisms to control the operation of the first two components. ... In order to manage the creation of the base trees and the application of the transformational rules, we have developed several layers of control mechanisms. ... The notion of a particular syntactic construction transcends the distinction between base and transformational constraints. ... We have developed a data base of structures called synspecs (for "syntactic specifications") which embody, at a very high level, the notion of a syntactic construction.

Examples of synspecs include "wh-question" and "second-person-imperative". Bates and Ingria also defined relations among synspecs, such as mutual exclusion (one synspec excludes another), requirement (one synspec requires another), and permission (one synspec permits the presence of another). This 'higher level of control' of a syntagmatically oriented syntax is a step towards the explicit specification of the paradigmatic organization of grammar; the relations among synspecs are a step towards a full-fledged system network of the kind Halliday developed for systemic grammar in the early 1960s. A similar need for paradigmatic organization also seems to arise when Functional Grammar is tested in generation; cf. Kwee (1980: 181).

However, we can also ask the question posed above in reaction to Ritchie's observations without making the assumption that we start with a syntagmatically oriented generative grammar: if we don't organize the grammar around the need to specify grammatical structures, how do we respond to the problem Ritchie identifies? There are two central parts to the solution, I think: (i) we have to organize the grammar paradigmatically as a functional resource for the

semantics; and (ii) we have to specify procedures for generation.

(i) Paradigmatic organization as functional resource

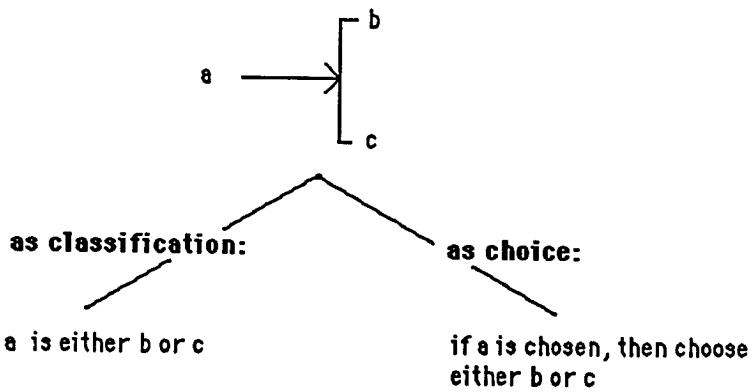
Part of the solution is to organize grammar paradigmatically rather than syntagmatically, as is done in systemic grammar by means of systems and system networks, and use the paradigmatic organization rather than the syntagmatic one as the interface to semantics. This is, of course, what Halliday had in mind when he discussed the system network in Halliday (1966):

> Systemic description may be thought of as complementary to structural description, the one concerned with paradigmatic and the other with syntagmatic relations. On the other hand it might be useful to consider some possible consequences of regarding systemic description as the underlying form of representation, if it turned out that the structural description could be shown to be derivable from it. In that case structure would be fully predictable, ... What is being considered ... is that that part of the grammar which is as it were 'closest to' the semantics may be represented in terms of systemic features.

I will consider the grammatical aspect of system networks in generation in Section II:1.2.1. I will consider the semantic interface based on this kind of paradigmatic grammar in Chapter III.

(ii) Dynamic grammar

But we also have to consider the dynamics of traversing the static system network; we have to characterize a generation algorithm: I will address this topic in Section II:1.2.1.6. The fact that procedures are foregrounded does not mean that we have to abandon accounts given in terms of relations such as a system network; but it means that the relations have to be interpretable procedurally. There must be procedural accounts of how system network are to be traversed and how realization statements are to be executed, etc. in addition to static accounts. Most descriptive work has been focused on the system network at rest and on structure as a static product of structure building. However, there are often two interpretations, a dynamic one and a static one. For example, systems can be read as instructions to choose between features under the condition that another feature or other features have been chosen (dynamic) or as statements about the classification of features (static):



relation	action
indicative	imperative
'declarative'	'procedural'

Fig. II:1.1-1: Two interpretations of the system

Thus the system in the diagram can be read either as a classification -- a is either b or c -- or as a choice -- if a is chosen, then choose either b or c.[3] Hudson (1976) emphasized the static interpretation of systems in his daughter dependency grammar by calling them *classification rules* and leaving out the arrow from the graphic representation. When Halliday devised the graphic representation of the system, he used the arrow to indicate the possibility of a dynamic reading in addition to the static one. The two readings differ in both transitivity and mood. The first is a relational indicative -- "a is either b or c"; the second is an action imperative "if a, choose b or c!". In computational linguistics,

[3] As we will see below in Section II:3.2.6, logical systems (i.e., systems within the logical subtype of the ideational metafunction) differ from the kind of system discussed here and raise the question whether it is always possible to arrive at an adequate static specification.

this kind of opposition has come to be known as declarative vs. procedural. There was a good deal of debate in the area of knowledge representation between the alternatives in the 1970s. The issue has been resolved in work on text generation by distinguishing between resources (or knowledge sources), stated declaratively, and processes, i.e., generation procedures: cf. Section I:1.1 above.

Other specifications in the grammar can also be read either as statements or as instructions. For example, the realization +Subject can be read as (i) there is a Subject; and (ii) insert a Subject; the realization Subject / Agent can be read as (i) Subject is Agent ("Subject = Agent"); and (ii) conflate Subject and Agent. In almost all cases, grammatical specifications can be read either dynamically or statically, but there are significant exceptions, which I will return to.

The fact that the various specifications in a systemic grammar can be interpreted both dynamically and statically is quite significant. Winograd (1972) emphasized the importance of the procedural approach, particularly in the use of procedures to represent meaning, and this may have lead some people to conclude wrongly that a systemic grammar is inherently procedural only: it has sometimes been suggested to me that that is the case. Winograd's work did show the importance of procedures in language modelling. However, although generation highlights the need for dynamic accounts, we may want to maintain both a static version of the grammar and dynamic interpretations of it. The static interpretation of grammatical specifications is neutral both with respect to directionality and with respect to temporal sequence, but generation and parsing tend to differ in directionality and temporal sequence. Since it makes

good economic sense to try to use the same grammar for generation and parsing, we can capture the grammatical resources used for both tasks in a static model and represent generation and parsing as two different procedural interpretations of this static model: Jacobs (1985) argues in favour of this kind of approach from a computational point of view. For example, the static system network might be traversed in one way in generation and in another way in parsing. That is, the system network represents the grammatical potential (the resource), which may be actualized (the process) in one way in generation and another way in parsing:

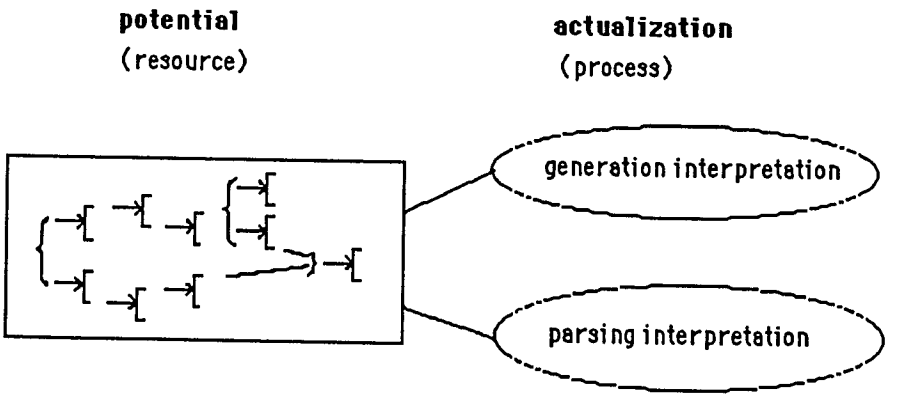


Fig. II:1.1-2: Differentiation of potential and actualization procedures

In my discussion of the system network in generation, I will start with the system network as potential at rest and then turn to questions of how to interpret it for generation: it is absolutely essential to work towards an expansion of the theory of grammar to include dynamic modelling.

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I have noted the need for paradigmatic orientation and for dynamic considerations. There is another fundamental principle, viz. the *metafunctional organization* of the grammar. We will meet this in various contexts. It comes up in the consideration of the descriptive coverage of a text generation grammar in Section II:2 so I will postpone the discussion until that section. The metafunctional principle will then be central again in Section II:3.2 in this chapter; there are later reflections of it in Chapters III and IV.

1.1.2 Tenor: explicit, formalized, detailed

The tenor of the relationship between linguist and user demands *detail, explicitness* and *formality*, since the user is a computer and not a knowledgeable linguist as in a lot of descriptive work.[4] The account has to be automatically interpretable. When there are gaps in the account, the computer cannot fill them in. It cannot disambiguate ambiguous statements. For example, if we describe a sequence such as

```
will have sent it off
```

as having a discontinuously realized Process *will have sent ... off* which is

[4] If we use a functional grammar, it has to be formalized. The formalization does not turn the functional grammar into a formal one. It is important to retain the terminological distinction between a (formalized) functional grammar and a formal one. For instance, the Nigel grammar is a functional grammar, not a formal one; it is simply a formalized functional grammar.

interrupted by the Goal *it* and if we write Process <Goal> to show that the Goal is included (represented by the angular brackets <>) in the Process, it will be perfectly obvious to us where the Goal appears, although there are three possibilities in the verbal group *will -- have -- sent -- off* realizing the Process. However, a generation algorithm would, of course, not know where to put *it* unless we had referred explicitly to the parts of the phrasal verb.

The demands raised by the computer user are often in conflict with the demands raised by a human user of the grammar. For a human, *perspicuity* is often a primary consideration and explicit detail may often obscure rather than help. Furthermore, it is time-consuming to maintain the degree of specification needed by the computer and for many purposes it may be preferable to devote time to descriptive *comprehensiveness* instead.

1.1.3 Mode: algebraic

The mode in generation by computer has to be algebraic rather than graphic; it has to be a mode that can be manipulated in computer programs. In descriptive work, the graphic mode is very valuable and has usually been favoured. Systems and system networks are represented by graphic diagrams and structures are represented by box diagrams. The distinction between the algebraic mode and the graphic one is important, since, although each can in principle be translated into the other, they are not always intertranslatable; in particular, the algebraic mode may lag behind the graphic mode of

representation. For instance, non-discrete modes of syntagmatic organization can be visualized graphically, but are more difficult to represent algebraically: cf. examples in Section II:3.2.

1.1.4 Generation vs. discourse analysis as contexts

Halliday's (1985) Introduction to Functional Grammar has served as a reference source since the work on the Nigel grammar began. It is intended for a variety of purposes, but a general goal is to give the reader the tools to do grammatically meaningful discourse analysis. The demands *manual* (human) discourse analysis puts on the grammar are, naturally, different in many respects from those raised by the task of *automatic* (computational) text generation. The two concerns can be used to illustrate the different effects on grammar in different contexts of use; they also constitute a commonly occurring contrast in the work on Nigel.

(i) **Field.** Generation is concerned with text in the process of emerging; discourse analysis typically deals with text as product. While generation puts emphasis on procedural accounts of how system networks are traversed and selections are realized structurally, discourse analysis needs accounts of structures that can be used in interpreting existing text.

(ii) **Tenor.** While generation needs detailed, explicit, and formal accounts, perspicuity and comprehensiveness are more valuable to discourse analysis.

(iii) **Mode.** While generation uses algebraic specifications, discourse analysis operates primarily with discursive and graphic accounts. At the same time, the choice of the mode of representation is, of course, a matter of tradition and personal preference. For example, while pedagogic grammarians of and before his day found diagrams useful to display syntactic analyses, Jespersen (e.g. 1937) clearly preferred to develop an algebraic representation. In systemic linguistics, graphic representations have played and important role and I will also make ample use of them.

The two contexts of generation and discourse analysis are summarised below.

	generation	discourse analysis
field	procedures; systems & realizations & structures	states; structures
tenor	detailed, explicit, formal	perspicuous, comprehensive
mode	algebraic	graphic or discursive

Fig. II:1.1-3: Generation vs. analysis as contexts for 'doing grammar'

In the work on the Nigel grammar, advances have been made in all three areas of the context -- field, tenor, and mode -- so that more demands can be met. For example, more is known about the process of traversing a system

network and about constituency ordering.

1.1.5 Variation in development

Some grammatical theories are quite context-specific: they may have been developed only for the purpose of computational processing and will have very little to offer discourse analysis or pedagogic uses of grammar; or they may have been developed primarily for the purpose of functional-typological work and may not lend themselves to use in parsing and generation. As noted in Chapter I, systemic linguistics has always accommodated a range of variations in field, tenor, and mode, for example allowing for a cline in the explicitness of the representation: diagrams and algebraic statements that can be interpreted formally co-exist. This cline has proved very useful, since different contexts place varying demands on the representation. Aspects of the theory can be represented diagrammatically, although we do not yet know how to give them a representation explicit enough to be implemented computationally.

There is, not surprisingly, a tendency for the development of explicit formal algebraic specifications to lag behind discursive and graphic specifications. (Cf. also Martinet's distinction between visualization and formalization in Parret, 1974.) Two examples will serve as a useful background for the discussion that follows: (i) one example dealing with the conception of systems and (ii) one example dealing with the conception of structure. They both need a development towards programmable algebraic specifications:

	existing	needed
tenor	peer group: √ implicit	computer: -- explicit
mode	discursive, graphic √	formal algebraic --

Fig. II:1.1-4: Needs in development

(i) The conception of systems: logical systems

The first example of explicit representation lagging behind the general theory comes from the logical component of grammar. When we attempt a formal implementation of systems and system networks, it is tempting to view a system network as a declarative specification that is a powerful notation for classifying. However, while this conception of the system network will allow us to deal with a good deal of grammar, it may not, as mentioned earlier, be possible to arrive at an adequate declarative specification of logical systems. The theory behind logical systems, the theory of *linear recursion,*[5] had been developed by the

[5] The recursion is linear in that it does not entail a movement along the rank scale as ordinary recursion does. Thus, *to be or not to be* is a complex of clauses; *to be* is expanded by *or not to be* and we could continue the expansion -- *to be or not to be and to do or not to do* -- but we would stay at the same rank: the recursion is linear. However, the recursion exemplified in ⟦*to be or not to be*⟧ *is the question* is accomplished through rank-shift; a unit of the rank clause is shifted to serve as if it were a unit of the rank group. Restrictive relative clauses also exemplify recursion through rankshift. Halliday (1979: 74) notes that examples such as *The day* ⟦*the lights went out*⟧ are not like linear recursion: "The recursion-like effect that is produced is an incidental outcome of the selection, at a particular place in structure, of an item from the same rank or from a higher rank in the constituency hierarchy. Clearly, this effect may appear more than once, as in a 'house that Jack built' routine; but it is strictly a non-event -- there is no function involved that we could identify as a recursive function."

mid 1960s (cf. for example Halliday,1965). A recursive system can be represented as follows in an informal graphic way.

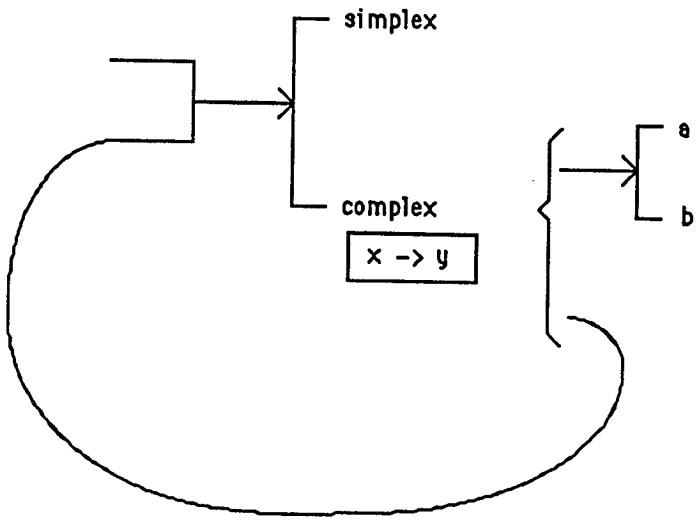

Fig. II:1.1-5: Informal graphic representation of recursive system

The system says: choose simplex or complex; if complex, choose a or b and return to re-enter the simplex / complex system. However, although the theory of linear recursion had been developed, the problem of the explicit representation of linear recursion had not been solved. When we have to implement the system network and look for appropriate existing mathematical models, it is quite natural to interpret a general system network as an *acyclic* graph, which means that systems are partially ordered and that there cannot be any loops that introduce cycles.

In the mid 1960s, Henrici worked with an explicit version of systemic representation for a computational implementation. Comparing embedding recursion (recursion through rankshift, for example a relative clause serving as a postmodifier in a nominal group) with linear recursion, he notes that the latter is "rather more troublesome" (Henrici, 1966/81). One problem is that the recursive system such as the one diagrammed above "would not be a conventional system, in that at least one of the terms in the system would also act as an entry condition to the system, contrary to the partial-ordering imposed on ordinary systems". In other words, the interpretation of the conventional system representation as a partial ordering made it fully explicit but at the same time this explicit interpretation excluded recursive systems. (We have had the same kind of experience in our work on the Nigel grammar.)

In the case of linear recursion, the lag between theory and explicit representation is still very much in evidence. There is no generally accepted explicit interpretation of it for a formal representation, neither for the recursive system nor for the structural output. I will return to the problem in Section II:3.2.4 below.

(ii) The conception of structure: box diagrams

The second example of the lag between theory and explicit representation is the representation of grammatical structure by means of *box diagrams.*

The box diagram is like a tree diagram in that it represents a product rather than a process, the product of a structure specification (realization statement), but it is used instead of the tree diagram because it facilitates the representation of more than one simultaneous function structure, i.e., of layering of functions from different metafunctions (ordered vertically as textual, interpersonal, and ideational; example from CEC, p. 453):

well	in the first World War	it	cost	us	over a million men
Theme		Rheme			
		Subject	Finite /Pred.	Compl.	Compl.
	Locative: time	Attribuend	Process	Beneficiary	Attribute

Fig. II:1.1-6: Box diagram with metafunctional layering

When we attempt a formal implementation of grammatical structure, it is tempting to stay with the kind of example analysed in the box diagram above. However, there are various structural relationships that do not pose a problem for the informal box diagram representation used in e.g. Halliday (1985) but which prove to be a problem for explicit realization statements. Discontinuity is the most important example. If verb sequences such as *make - roll* are interpreted as "serial" verbal groups realizing one Process in the clause as Halliday (op cit., Chapter 7A) does, the Process is discontinuous, which can easily be diagrammed ---

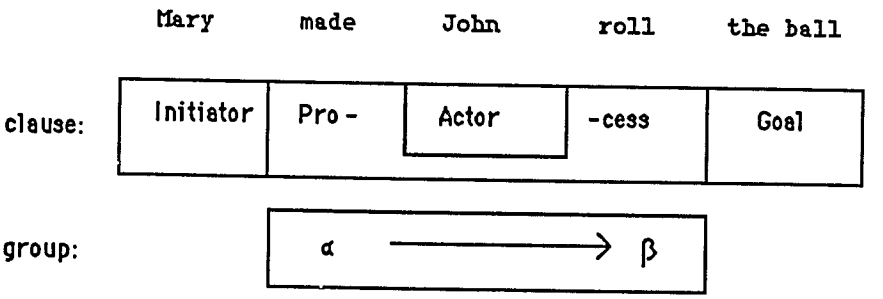

Fig. II:1.1-7: Diagrammatic representation of discontinuity

-- but which cannot be represented in the Nigel grammar at present.

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I will now characterize systemic grammatical theory as it is supported in the Nigel grammar, which we can take as the baseline grammar in relation to which problems can be identified and extensions can be made. My next step will be to identify problems and discuss possible solutions and extensions. Whenever we consider solutions, there is a high demand on them: the representation should be as natural, as iconic, as possible with respect to the theory. Functional felicity is more important than generative power.

1.2 Baseline grammar

ABSTRACT. The following diagram summarises abstractly how the Nigel grammar works in generation. The grammatical potential is stated in terms of the system network. Realization statements for building structure are associated with systemic features in this system network; they specify the grammatical structure of a unit step by step. The potential is actualized by means of the grammatical generation algorithm.

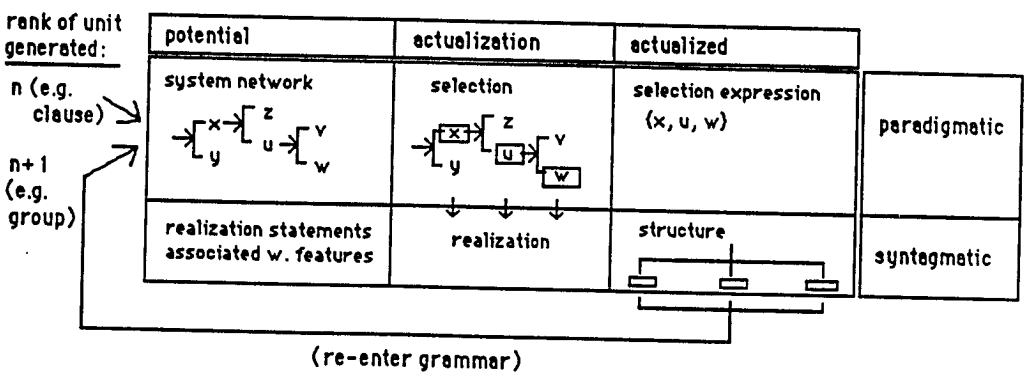


Fig. II:1.2-1: The grammar in generation

The generation algorithm traverses the system network of the unit of a particular unit of rank *n*, say clause rank, by selecting features in systems. At the same time any realization statements associated with the features selected are executed, leading to a specification of a fragment of structure. The result of the traversal is a record of the features selected, the selection expression, and a

grammatical structure for the unit being generated -- a particular actualization of the potential. The grammar is entered first at the highest ranks of the rank scale. After the traversal has been completed, the grammar is re-entered to develop each of the constituents of the structure generated (unless they are specified lexically). Unless there is rankshift, these constituents will all be units of the rank next below rank *n* (n + 1), i.e. group/phrase rank if the previous rank was clause rank.

The grammar has a paradigmatic base: the principle of organization is the system network, which represents the grammatical resources at the speaker's disposal, and this is where I will start the discussion.

1.2.1 Paradigmatic organization

Lexicogrammar is a *resource* for expressing meanings. Paradigmatically, the lexicogrammatical resource is organized as a set of inter-related choices. I will start by briefly considering how the paradigmatic organization can be represented. I will then move onto various aspects of the systemic representation of paradigmatic organization -- the system network.

1.2.1.1 Representing paradigmatic organization

When Halliday devised the system network to represent this paradigmatic organization, there were no alternative representations around in linguistics for representing inter-related choices. To see some of the motivation behind the system network, we can first consider two other kinds of nets that have been used in computational linguistics, discrimination nets and transition nets. We can then turn to flow charts. All three represent simplifications of the full picture given in the introduction:

(i) We can try to represent the paradigmatic potential in terms of syntagmatic organization: transition networks.

(ii) We can try to represent the paradigmatic potential as a unifunctional potential (as if there were no simultaneous metafunctions): discrimination nets.

(iii) We can try to represent the paradigmatic potential in terms of a procedure for actualizing it: flow charts.

The three alternatives are contrasted with the system network in the table below. The arrows indicate that transition networks and flow charts specify paradigmatic potential in terms of other other types of organization.

	potential	activation	
paradigmatic	system network		multiple
	discrimination network ←	flow chart	single
syntagmatic	transition network		

Fig. II:1.2-2: Approaches to paradigmatic representation

Since the three approaches try to represent the paradigmatic potential in terms of something which it is not, they fail to capture certain aspects of the organization we need to represent or impose organization that is not inherent in paradigmatic organization. As we will see, the systemic approach is to use multiple representations: the system network is used to represent paradigmatic potential, the activation of this potential is stated separately, and realization statements are used to specify the syntagmatic organization.

As the representational task for the three approaches, I will use the paradigmatic organization of mood in English: clauses are either imperative or indicative. If they are indicative, they are either declarative or interrogative; and if interrogative, wh- or yes/no.

1.2.1.1.1 Paradigmatic organization in terms of syntagms

Transition networks have typically been used in computational linguistics to represent alternatives in terms of syntagmatic organization, more specifically in terms of strings of grammatical classes.[1] A transition network can be used to describe a string of grammatical classes with alternatives; it can be used to describe a set of strings. It consists of a set of states and a set of arcs. A state is a node in the network and an arc is a transition between two nodes.

In a transition network grammar, the arcs are labelled by classes such as nominal group, verbal group, and adverbial group. In this context, it is important to consider the two ways in which syntagmatic organization can be represented (anticipating a discussion I will return to in Section II:1.2.2.2.1):

(i) [function] structure: syntagmatic organization can be represented as a configuration of grammatical functions -- as a so-called [function] structure; and

(ii) syntagm [of classes]: syntagmatic organization can be represented as a sequence of classes such as nominal group, verbal group, and adverbial group -- as a so-called syntagm.

The function structure allows for a set of different syntagmatic perspectives on the same syntagm; for example, the first nominal group in the syntagm

[1] The transition network developed for generation by Simmons & Slocum (1972) was different: see Section I:2.

consisting of nominal group + verbal group + nominal group is Subject as well as Actor and Theme:

	The ugly duckling	escaped	the hungry farmer
(i) structure	Theme	Rheme	
	Subject	Finite/	Complement
	Actor	Process	Range
(ii) syntagm	nom. gp.	verbal gp.	nom. gp.

Fig. II:1.2-3: Function structure and syntagm

It is the second, functionally undifferentiated, way of representing syntagmatic organization that is incorporated into a transition network grammar: the arcs in the network have class labels rather than function labels and the syntagmatic organization is represented once, not in several layers according to the various functional perspectives.

If we use a transition network grammar to represent the grammar of mood, we get into trouble almost immediately. The only alternations that can be represented are those that correspond directly to differences in grammatical classes or the sequence of grammatical classes. For example, we can represent yes/no vs. declarative as an alternation.

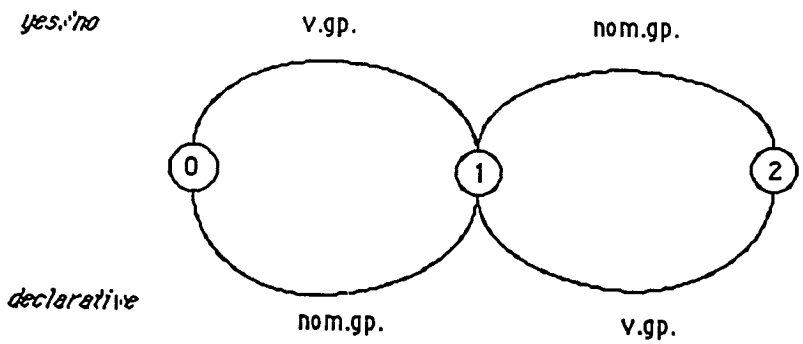


Fig. II:1.2-4: MOOD choices in transition network grammar

I will briefly mention three problems: the problem of delicacy, the problem of disjunction, and the problem of simultaneity.[2]

(i) The problem of delicacy. While it is possible to represent all the sequences of nominal group and verbal group we find in the various mood types, we cannot represent the alternation between imperative and indicative, between interrogative and declarative as subtypes of indicative, or between wh-interrogative and yes/no interrogative as subtypes of interrogative very easily. In general, we can only represent one level of alternation by means of alternative arcs in the network; we cannot represent the ordering of alternations in delicacy.

(ii) The problem of disjunction. It is hard to represent alternations that apply to disjunctions of mood types. For example, we would not be able to represent the fact that no interrogative clauses can be tagged whereas either declarative or

[2] I'm focussing on the simple transition network and won't discuss Augmented Transition Networks, the augmentation of it with registers.

imperative ones can. *(iii) The problem of simultaneity.* Even if we could represent the paradigmatic grammar of mood satisfactorily, we would not be able to represent the simultaneous organization of transitivity choices. Since the alternations are stated in terms of the sequence of classes and there is only one such sequence in a unit, we can only represent one set of alternations between two states.

The general problem is that we cannot write a paradigmatic grammar directly in terms of alternations in syntagms; or, if we tried, it would be a trivial one. We need a representation of paradigmatic organization that is freed from the sequence of grammatical classes. Discrimination nets hold more promise in this respect.

1.2.1.1.2 Choice as discrimination network

If we use a discrimination net, a.k.a. a decision tree, we might sketch the following grammar, in which the nodes are features that represent the mood options:

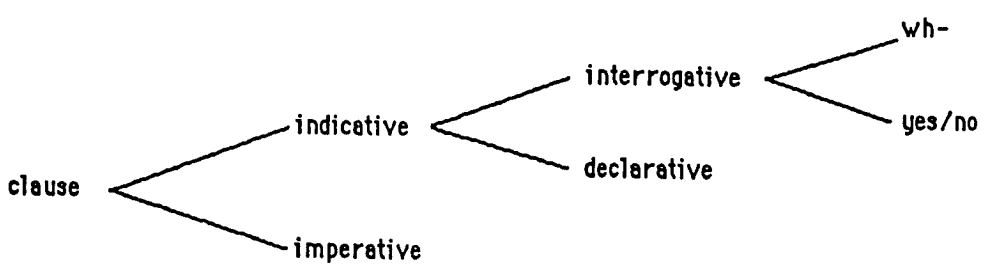


Fig. II:1.2-5: Discrimination network grammar of mood

This is a very simple organizational method -- the classical taxonomic tree -- but it still allows us to represent the basic mood options.[3] However, we encounter two central problems when we try tc extend the grammar, (i) the problem of disjunction and (ii) the problem of simultaneity.

(i) The problem of disjunction. Since the net is a tree, we cannot represent alternations that apply disjunctively to nodes in the tree. For example, we cannot represent the fact that either declarative clause or imperative clauses can be tagged (to the exclusion of interrogative ones):

```
You're tired, aren't you?
Get up, will you?
Let's eat, shall we?
```

(ii) The problem of simultaneity. The tree only represents the organization of the clause as a mood unit. The clause is simultaneously a unit of transitivity, but the tree does not allow us transitivity choices alongside mood choices. Even this brief example indicates that trees are insufficient to represent paradigmatic organization. The system network addresses the two shortcomings that were illustrated. Alternations are represented as systems with simple or complex entry conditions; and the system network has breadth: two or more systems can apply simultaneously.

[3] It is the principle of the organization of inquiries into choosers and we will return to it in Chapter III.

1.2.1.1.3 Flow charts: potential as procedure for actualization

The first problem with a discrimination network grammar, the problem of disjunction, can be addressed if we represent the grammar of mood by means of a flow chart:

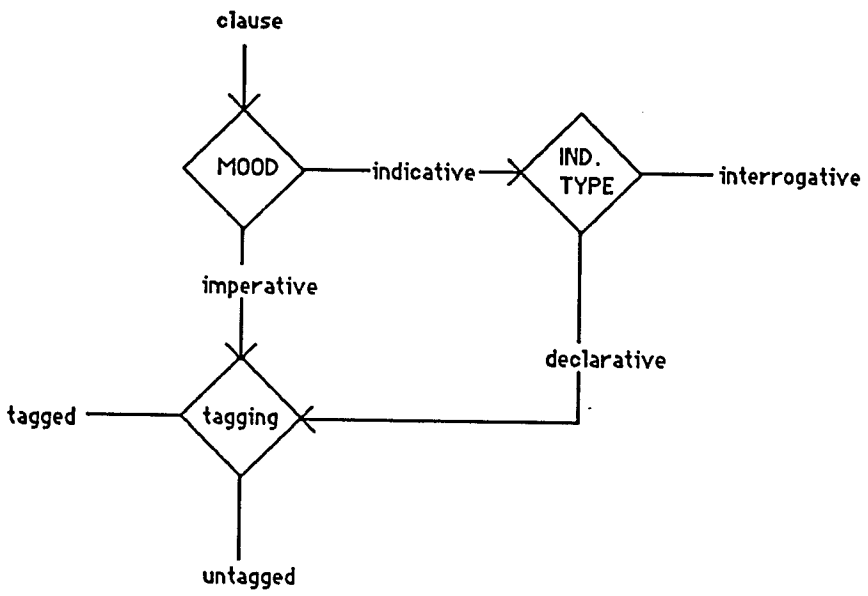


Fig. II:1.2-6: A flow chart grammar of mood

While the problem of disjunction finds a solution in the flow chart, the problem of representing simultaneous choices remains. That is, since the flow chart is a means for representing sequential procedures, in which the 'next step' is always determinate, choices can only be represented as sequential and the flow chart does not allow us to maintain the distinction between choices that

are truly sequential (ordered in delicacy) and choices that are simultaneous but have to be represented sequentially in a flow chart.

1.2.1.1.4 System networks

Let's now briefly consider how the system network of systemic theory can deal with the issues of the grammar of mood identified above. I will introduce it very quickly here and then discuss it in more detail in the following subsections. A system network represents a set of inter-related choices. It is a large directed acyclic graph whose nodes are choice points, called **systems**. An excerpt from the system network of TRANSITIVITY and MOOD can serve as a simple example.

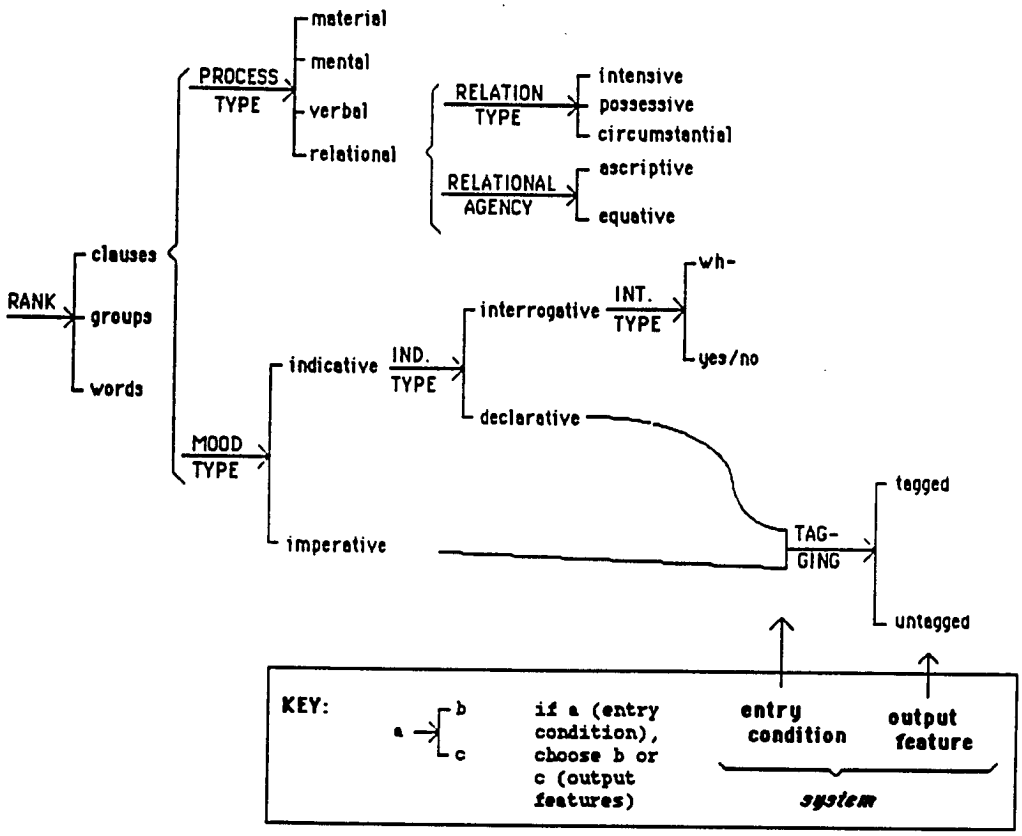


Fig. II:1.2-7: System network fragment

The system network above consists of eight systems, whose names are capitalized. Each system has two or more **terms** or output features representing a grammatical alternation, such as indicative / imperative in the

system MOOD TYPE. In addition, each has an **entry condition**, which is the condition under which the systemic choice is available and is stated as a term or combination of terms from other systems. For instance, the system MOOD TYPE has the entry condition 'clauses'. The entry condition may be a simple feature (clause, interrogative) or a complex of features (for example the disjunction declarative / imperative in the system TAGGING).

Given an algorithm for traversing it (see Section II:1.2.1.6 below), the system network can be used to generate grammatical paradigms; for instance, the following paradigms can be generated:

clauses: material & indicative: interrogative: wh-

clauses: (relational: intensive & ascriptive) & declarative: tagged

The system network does not generate grammatical structures; the 'bare' system network represents a purely paradigmatic grammar and it needs a realization component to produce grammatical structures. It is important to emphasize this fact: because of the focus on structure in many approaches to syntax, the system network has sometimes been taken to be a syntagmatic rule formalism comparable to phrase structure rules.[4] If we want to look at the system network from the point of view of structure, it is much less misleading to think of it as a metastatement comparable to the much more recent notion of metarule in Generalized Phrase Structure Grammar; for instance:

[4] This is a type of misunderstanding that goes back to Postal (1964).

metastatement		structural statement
interrogative →	yes/no	Finite ^ Subject
	wh-	+Wh, Wh ^ Finite

Fig. II:1.2-8: System as metastatement

That is: the structure fragments Finite ^ Subject and Wh ^ Finite are opposed as the alternatives 'yes/no' vs. 'wh-' in interrogative clauses. The notion of 'meta' indicates the relationship between system network and structure; it is a symbolic one, not a compositional one, and realization is necessary to relate the two.

The system network can handle the problems of delicacy, disjunction, and simultaneity discussed above without any difficulties.

(i) Delicacy. Since it is an independent statement of paradigmatic organization, the system network can easily handle delicacy, thus distinguishing it from transition networks. Furthermore, there can be variation in the delicacy of the paradigmatic context of a syntagmatic specification. Syntagmatic specifications can be delayed in delicacy, as in the case of the specification of the sequence of Subject and Finite, syntagmatic contrasts can be distributed across the system network, as in the case of the contrast between the sequences Subject fl Finite (Subject before Finite) in declarative clauses

and Finite fl Subject in yes/no interrogative ones.

(ii) Disjunction. Paradigmatic oppositions may apply disjunctively to paradigmatic contexts. The example used above was tagging. It is problematic for a strict taxonomy such as a discrimination network but a system network can handle it without any problems. The network in Figure II:1.2-7 represents the generalization that tagging a clause is an option if it is declarative (*you accepted, didn't you*) or imperative (*accept, will you*): the system TAGGING has the disjunctive entry condition 'declarative / imperative'.

(iii) Simultaneity. Paradigmatic simultaneity is a problem for the three approaches discussed above. There is no provision for it with transition networks and discrimination networks; and flow charts impose an ordering on simultaneous contrasts. System networks handle simultaneity without any problems. In the example above, the systems PROCESS TYPE and MOOD TYPE as well as their descendants are simultaneous. A system network thus allows for cross-classification in multidimensional paradigms.

As we will see, the system network also serves to organize the generation process and the semantic interface, and it defines the contexts in which structure building realization statements are applied.

1.2.1.2 Dimensions of the system network: breadth & delicacy

The system network can be thought of as a two-dimensional space of grammatical choice alternatives; any choice is located in relation to the two coordinates of this space:[5]

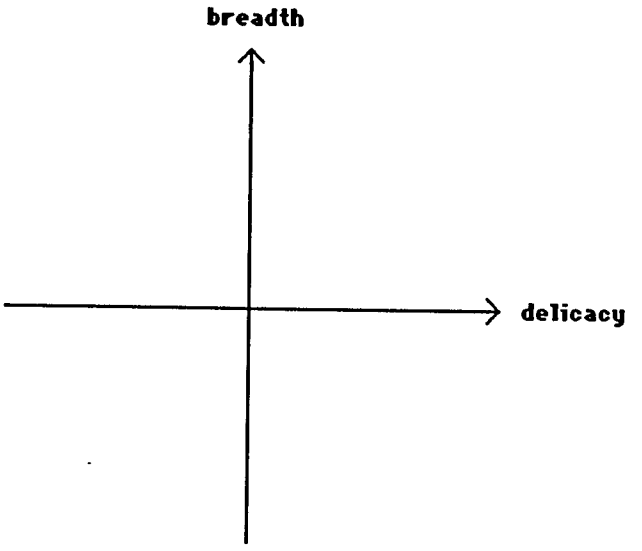


Fig. II:1.2-8: Two dimensions of the system network

The two dimensions are delicacy and breadth. *Breadth* represents simultaneity in choice and is typically associated with metafunction: there is breadth in the system network because it represents more than one metafunction. *Delicacy* is ordering of system in the network and can be stated

[5] Rank and delicacy are two of the three scales defined in Halliday (1961); the third is exponence (called realization in later work): breadth is not one of the scales. However, it will turn out to be helpful to use breadth as a scale. For example, it is needed to discuss the overall layout of the system network and correlates with metafunctional simultaneity in the network. Further, we will be able to used it in discussing the coverage of a text generation grammar.

numerically, from one upwards; in Nigel, the upper limit is around fourteen.[6] Delicacy and breadth are illustrated below for a fragment of the clause network.

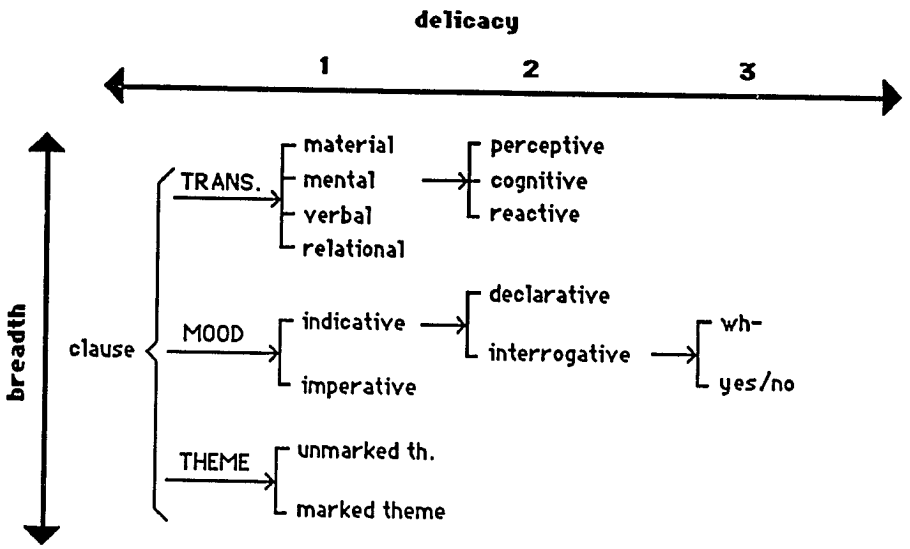


Fig. II:1.2-9: The breadth and delicacy of a grammar

If the system network did not have breadth, all systems would be completely ordered by delicacy; since it has breadth, the systems of the network are only partially ordered. This, then, is the overall shape of the system network. I will now discuss the systems and gates that make up the system network.

[6] The delicacy would be considerably higher if the Nigel grammar was extended to include lexis; see Section II:4 below.

1.2.1.3 The connectivity in the system network: features and systems

Systems and gates make up the system network but they are themselves complex; the primitives of the system network are the features. They enter into the relations conjunction, disjunction, and implication that define the other constructs used to represent paradigmatic organization -- systems, gates, and system networks:

Abstraction		Symbol	
		algebraic	graphic
Primitive	feature	a b c d	
Relations	conjunction	&	{ }
	disjunction	/	] [
	implication	:	→
Complexes	systems (including gates), system network	a & b : c / d	a, b } → [c, d

Fig. II:1.2-10: The building blocks of the system network

For instance, the system INTERROGATIVE TYPE from the system network above can be stated as an implication between a single feature and a

disjunction of features: 'interrogative: yes-no / wh-'; i.e., if 'interrogative', then either 'yes-no' or 'wh-'.

The relations define the dimensions of the system network. The implication relation --> orders systems in delicacy.[7] A right-facing conjunction gives the system network breadth.

1.2.1.3.1 Systems and gates

A system (or gate) consists of an entry condition (input features) and terms (output features). An entry condition is a feature complex or feature simplex which implies the terms and is implied by the terms. Both systems and gates have feature outputs, but while a gate only has a single feature as its output, a system has a disjunction of at least two features.[8] Output features may have realization statements such as (Insert Subject) and (Conflate Subject Agent) associated with them; see Section II:1.2.1.5.1. The differences between systems and gates are tabulated below:

[7] We can also interpret this relation as classification. The implication also holds in the other direction: the terms of a system imply its entry condition. This direction is important in path augmentation in generation, to be discussed below. It is also important if the general traversal of the system network is 'backwards', from right to left, as it is in a system driven by the semantics: cf. Section III:6. The direction is also central in analysis.

[8] For a system, there is no restriction to a binary output, as in Hudson's (1976) statement of Daughter Dependency Grammar.

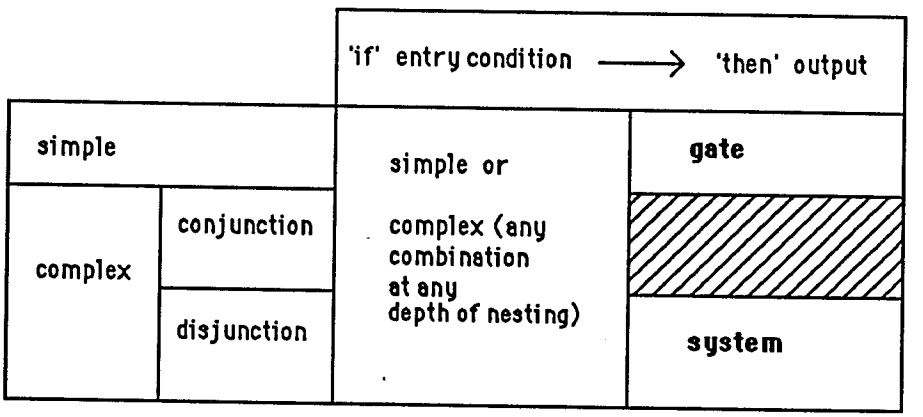


Fig. II:1.2-11: System and gate (i)

Abstract examples are given below. Any type of entry condition may be combined with either type of output:

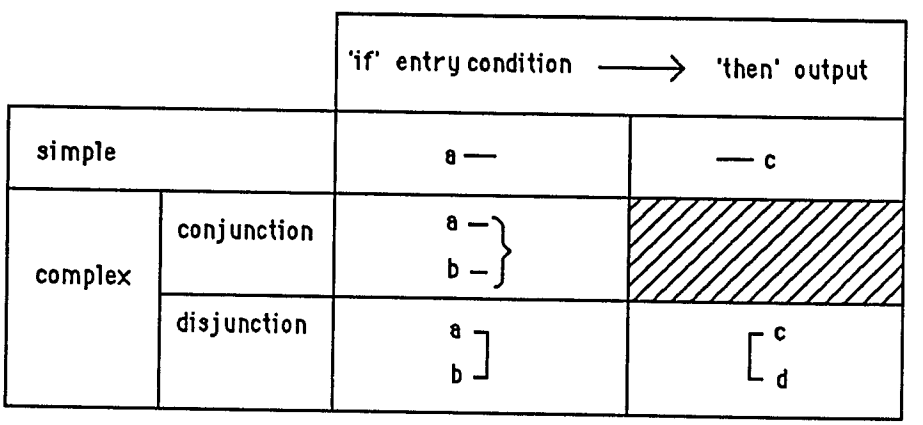


Fig. II:1.2-11: System and gate (ii)

Feature complexes as inputs (entry conditions) can be more complex than a simple conjunction or disjunction; there is no limit to the nesting within tbese

feature complexes. For example, a conjunction can have a disjunction as one of the conjuncts. The disjuncts of a system output are always simple features. (As the overview implies, certain feature combinations are excluded; for instance, there are no systems whose terms are conjunctions of features. I will touch on this issue in Section II:1.2.1.3.4.)

A disjunction in the entry condition of a system or gate is not exclusive; if the input to a system/gate is a disjunction of two features, both of the disjuncts may be satisfied. However, when the system network is traversed, the system is only entered once; an output feature can only be chosen once in a pass through the grammar.

I will now discuss systems and gates in more detail.

1.2.1.3.2 Systems

The disjunction of the output of a system is exclusive; only one of the output features (terms in the system) may be chosen and in this respect all systems are the same. Systems differ to some extent in how their output features are used and we can set up a simple typology of systems based on these differences in use. There are essentially two considerations that determine how an output feature is used:

(i) network-internal consideration -- network connectivity: does the output feature lead to the entry condition of another system (gate)?

(ii) network-external consideration, from below -- realization: does the output feature have one or more associated realization statements?

Based on these considerations, we can recognize three major types; they are tabulated and exemplified below.

TYPE OF SYSTEM		EXAMPLE	
		example of type	connectivity
unary: gates		agentive subject +Agent; Agent/Subject	
multiple	privative	location +Locative nonlocation	spatial temporal
	equipollent	indicative +Subject imperative	declarative interrogative jussive suggestive oblative

Fig. II:1.2-12: Typology of systems based on output features

Gates are the limiting case, since they are 'defective' systems in that they have only one term; see further Section II:1.2.1.3.3 below.

Privative systems are all binary in the Nigel grammar. One of the two terms represents the positive choice and has a realization statement associated with it; this feature is typically the entry condtion to further system(s) -- the feature 'location' in the table. The other term can be called unmarked; it has no realization statement associated with it and does not appear in any entry conditions; it is a dead end -- the feature nonlocation in the table.

Equipollent systems, such as the system indicative / imperative in the table, have two or more features, all of which have realization statements associated with them and/or lead to further systems in the system network. (The systems dependent on indicative and imperative are also equipollent, although realization statements associated with their output features are not shown in the table.)

The distinction between privative and equipollent is used by Trubetzkoy (1939: 66 ff) to characterize the relation between the members of a phonemic opposition. He recognizes another type as well, viz. gradual opposition, where the members of the opposition represent different degrees of the same property. In other words, a system may be a discrete representation of a cline (cf. Halliday, 1961). While it is useful for certain purposes to distinguish between gradual and equipollent systems in the grammar[9], it is not clear that there are any formal criteria comparable to the ones used to distinguish between privative systems and others and I will simply call non-privative systems equipollent.

[9] For instance, if the phonological realization also is a cline.

The typology is important for a variety of reasons. Of particular significance in the present context are the reasons for choosing one feature rather than another in a system. For example, different kinds of chooser inquiries are appropriate for privative systems and equipollent ones: the inquiry-semantic interface provides us with a third type of consideration in addition to the two mentioned above. It is network-external, but 'from above'.

Futhermore, although the two types are currently treated in the same way in generation in Nigel, the generation process would be simpler if the unmarked status was given special recognition. It would then be possible to state that the unmarked feature is always chosen unless there was an explicit reason for choosing the marked one. Consequently, it would not be necessary to explore the choosers of these systems in the traversal of the system network unless there was positive reason for doing so.

1.2.1.3.3 Gates

The gate is a device that is widely used in Nigel, but which has not been standard in systemic grammars before. Paradigmatically, it can be thought of as a renaming device: a certain feature complex (the entry condition) is given a one-feature name (the output). The feature complex may be either conjunctive or disjunctive; or a combination of the two. I will illustrate (i) a conjunctive entry and (ii) a disjunctive one.

i) Conjunctive entry condition. In the following network fragment the combination of the features effective and relational is renamed equative.

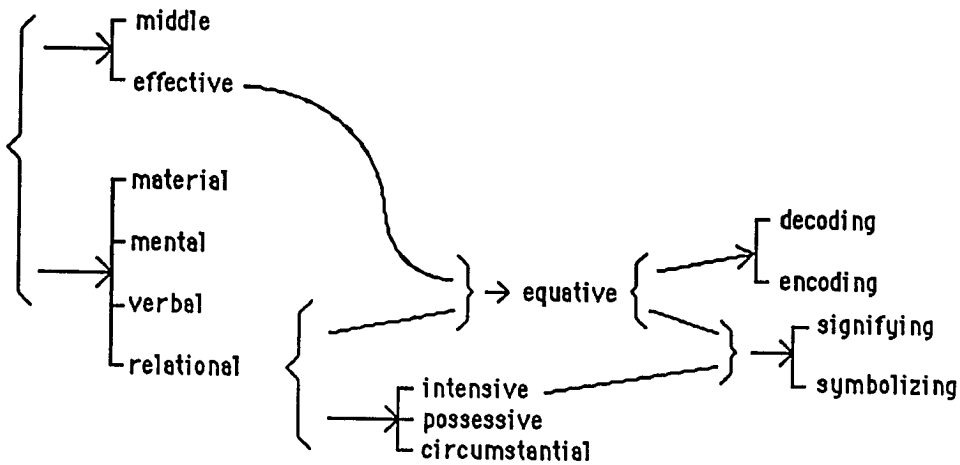


Fig. II:1.2-13: Gate for renaming conjunctive feature combination

The feature equative can now be used as the entry condition to a number of systems, two of which are diagrammed above: decoding / encoding and signifying / symbolizing. Without the feature, it would be necessary to repeat the conjunction of effective and relational. The introduction of the feature equative thus serves to recognize a repeated feature combination.

(ii) Disjunctive entry condition. In the following interpersonal network fragment, the features negative and polarity form a disjunctive entry to the gate ASSERTION with the single output non-assertive.

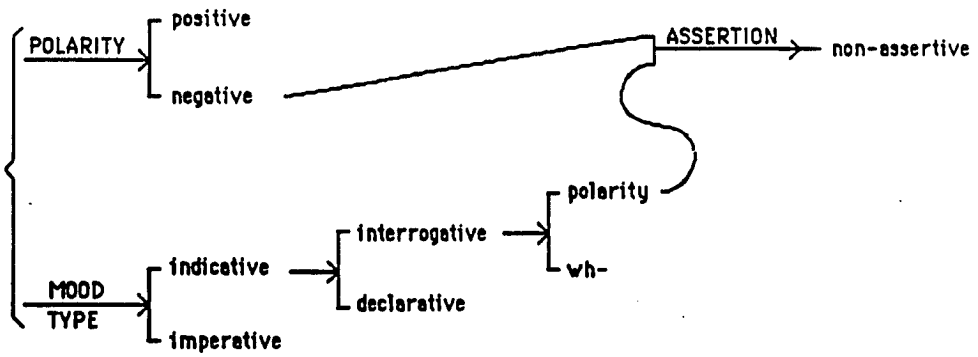


Fig. II:1.2-14: Gate for renaming disjunctive feature combination

The purpose of the gate is to define the notion of a non-assertive clause which may require "do-support" and non-assertive items such as *ever* and *any*. The entry condition may be satisfied by negative, polarity, or both and this illustrates the value of defining the left-facing 'or' as 'and / or'.

A gate with a disjunctive entry condition is perhaps of particular theoretical interest, since the output feature represents a 'disjunctive class'. The notion of non-assertive is one example of this. Another possible example is the feature 'mass' if it is analysed as 'non-singular' or 'non-plural' by means of a gate with the disjunctive entry condition 'non-singular / non-plural':

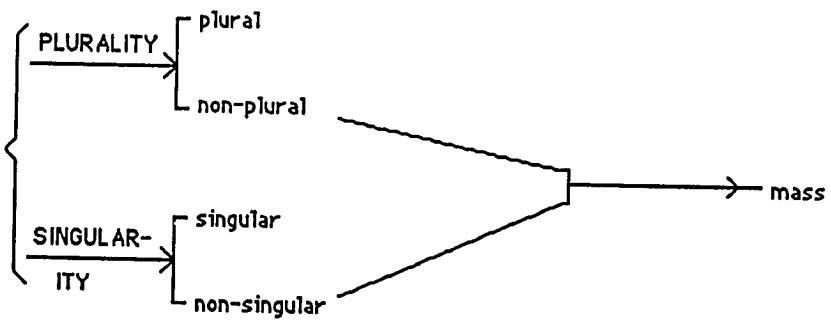


Fig. II:1.2-15: 'Mass' as disjunctive class

(Of the two number systems, SINGULARITY applies to non-specific determiners (e.g., singular: *a* / non-singular: *some*) and PLURALITY applies to specific determiners (e.g., plural: *these* / non-plural: *this*) and to number in the verbal group.)

A gate with a disjunctive entry condition can be used to add a feature to handle a deficient paradigm. In nonfinite elaborating clauses -- relative clauses -- there is a choice between a modulated type (e.g., *the person to do the job*) and a nonmodulated type (e.g., *the person doing the job*) if the Wh is the Subject of the clause; otherwise, the clause is obligatorily of the modulated type (e.g., *the person to ask*). The modulated type has an infinitival verbal group expressing obligation or ability -- *to do the job* 'who should do the job; who can do the job'. The nonmodulated type has a participial verbal group, either active or passive:

	modulated	nonmodulated
subject-wh	person [[to do the job]]	person [[doing the job]] [[shown around]]
nonsubject-wh	person [[(for you) to show around]]	

Fig. II:1.2-16: Paradigm to be described

If we set up subject-wh / nonsubject-wh and modulated / nonmodulated as simultaneous systems, the grammar will wrongly generate the gap in the paradigm -- the combination of nonsubject-wh and nonmodulated:

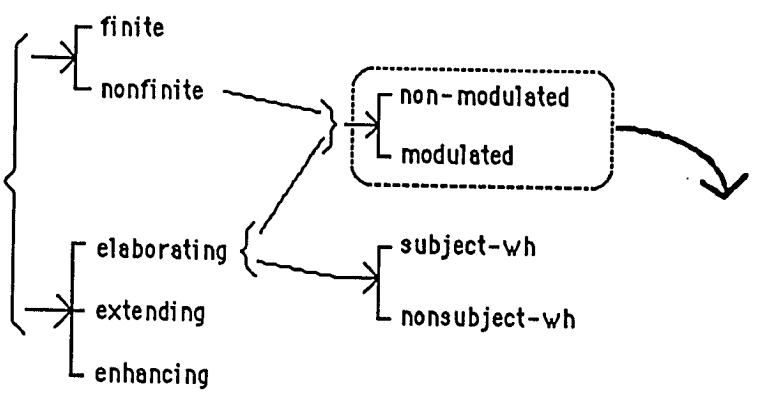


Fig. II:1.2-17: Change in network to handle gap in paradigm

Systemic linguists have used marking conventions to deal with paradigmatic holes of this kind but these conventions have not been implemented in Nigel for

reasons to be discussed below (Section II:3.1). The strategy I have used in Nigel is the gate. The entry condition to one of the simultaneous systems is made more restrictive, which moves the system to the right in the system network, as indicated in the diagram above. In the present example, the system modulated / non-modulated is given the entry condition nonfinite & subject-wh. Then, a gate is introduced and is given a disjunctive entry condition that defines the complement of the paradigmatic gap: modulated / nonsubject-wh in the present example.

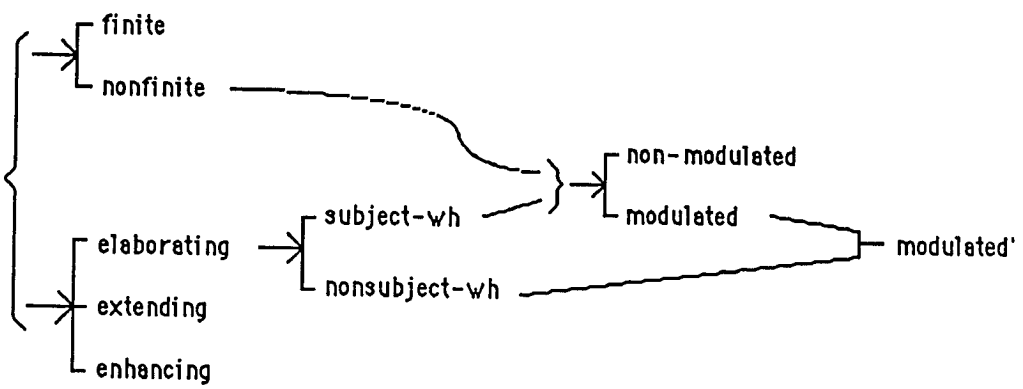


Fig. II:1.2-18: Use of gate to add feature in system network

This network fragment allows us to generalize across nonsubject-wh and modulated elaborating clauses: they share the feature modulated' and we can associate the realization of the verbal group as infinitival with this feature. This illustrates a general characteristic of the use of gates in Nigel: a realization statement is typically associated with the output of a gate. There are at least two reasons for using a gate in conjunction with a realization statement:

(i) To state **conditional realizations**. For instance, we may want to state 'given feature m, insert function F if feature n also has been chosen'. This is formally equivalent to a conjunction of the two features: 'given features m & n, insert function F'. We can use the gate to do the job for us without additional mechanism.

(ii) To **collect** or compile all instances of one realization statement such as + Subject in one place: There are various conditions under which Subject may be inserted; instead of repeating + Subject in all these different places, we can specify one gate with a disjunction of the different conditions under which Subject is inserted as the input of a gate.

A gate for inserting Subject is given below. It illustrates both the disjunction in the entry condition used to collect all instances of Subject insertion to a single location in the system network:

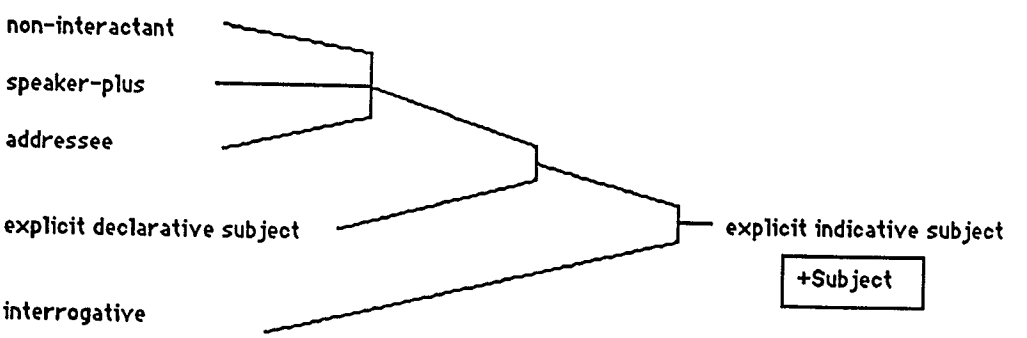


Fig. II:1.2-19: Subject insertion by gate

Gates with disjunctive entry conditions that are used to collect all instances of a realization statement such as '+Subject' have to be defined by the grammarian developing the grammar but they could in principle be automated. That is, they can be regarded simply as compilations of the realizational information distributed across the features that constitute the disjuncts of the disjunctive entry condition.

1.2.1.3.4 What is not a system in the baseline grammar

I have characterized systems and gates as they exist and are used in the current Nigel grammar. I will now just mention some conceivable system types that are excluded; some of these are part of systemic theory, while others are not.

(i) Terms in systems and gates are simple features; we can equate term with output feature. The alternative is to allow terms to be feature combinations as well as simple features; in particular, to allow them to be conjunctions of features. The possibility of conjunctive terms is an automatic consequence of Kasper's (1987) translation of systems into FUG notation. I will return to it briefly in Section II:3.1.

(ii) Terms in systems are unconditional. That is, while a system has an entry condition, it does not have selection conditions on terms: once the entry condition has been satisfied, any term can be selected unconditionally. I will

also return briefly to this property in Section II:3.1.

(iii) Terms in systems are mutually exclusive. The alternative is to define an 'and/or' type of system in addition to the current exclusive 'or' type of system. Such a system would allow for the selection of one or more of its terms. I will mention a potential use for such a system type in Section II:3.2.6.4.

(iv) The terms of a system cannot figure in its entry condition. There is a clear need for systems with loops from input to output: see Section II:3.2.4.

1.2.1.4 Global organization: the number of networks

The previous section dealt with various issues of the local connectivity in a system network. The question I will turn to now is whether the global paradigmatic organization of the grammar is to be represented by a single system network or a set of system networks.

1.2.1.4.1 How many system networks?

The two dimensions of the overall organization of a system network are breadth and delicacy. The treatment of the rank scale and primary class will determine the overall number of system networks; there are two possible approaches to the organization of the system network:

(i) **Multiple networks:** The grammar may consist of a set of independent networks, at least one for each rank, i.e., one clause network, one group/phrase network, one word network, and one morpheme network; or one network for each primary class in the grammar, e.g. one clause network, one nominal group network, one verbal group network, and so on.

(ii) **Single network:** The grammar may consist of a single network in which the ranks are the options in the first system.

The first approach was used in e.g. Halliday's (1964/1976) Bloomington grammar. The second approach has been used in e.g. Hudson (1971, 1976) and Fawcett (1980). It is also used in the current version of Nigel. The two alternatives differ in some respects. In particular, the single network approach allows any systems to interact, regardless of whether they are clause systems or nominal group systems. At the same time, the multiple network approach allows the reuse of features and systems from one network to another, since each network constitutes a new context.

1.2.1.4.2 Consequences of single system network

The first system entered in Nigel is RANK. The entire system network can be reached from this system. Halliday has described the grammar of English as one huge network (Halliday, 1969), which is what the Nigel grammar is. When the grammar is treated as a single network, the notion of rank is represented systemically as a system. In this respect, the Nigel grammar is like the grammar

in Hudson (1971).

There are a number of consequences of treating the grammar as a single network:

(i) **Rank** and primary **class** get represented systemically.

(ii) **Shift:** Rankshift can be represented in the network as an option.[10]

(iii) **Sharing:** There can be system sharing between ranks and between classes. For instance, circumstantial systems might be shared between clauses and nominal groups whose heads are process nominalizations.

I will examine the first two.

1.2.1.4.2.1 Rank and primary class in the network

In the theory presented in Halliday (1961), primary classes and secondary classes are distinguished. Primary classes are the least delicate classifications of units of the various ranks, for example nominal group, verbal group, and adverbial group at group rank and the traditional word classes at word rank. Secondary classes constitute the next step in delicacy; they are the various

[10] Class shift can also be represented in the network as an option. This is similar to rankshift, except that the shift is one of class rather than one of rank. For instance, one might want to set up a description where 'intransitive' prepositional phrases such as *alongside* in *we ran alongside* are re-classified as adverbial groups.

subclasses of primary classes, such as finite and nonfinite verbal groups. Systems did not appear until secondary class; that is, secondary classes were the terms in the first systems. THis is a direct continuation of Firthian system-structure theory, where a system operated at a particular place in a structure,[11] such as Subject or Adjunct, and there is no structural place for rank or primary class as systems but secondary classes form systems at particular places. This can be illustrated for Subject, Predicator, and Adjuncts, which are elements of clause structure and constitute places at which primary (group/phrase) classes operate (cf. Halliday, 1961: § 6.1).

Place in structure	Primary classes operating at these places	Secondary classes
Subject	nominal group	
Predicator	verbal group	→ finite / nonfinite (SYSTEM)
Adjunct	adverbial group	

Fig. II:1.2-20: (Primary) class and system in Halliday (1961)

As can be seen, the primary classes have different syntagmatic environments. For example, nominal group operates at Subject, verbal group at Predicator,

[11] The place is thus the syntagmatic context in terms of which the system makes sense. Cf. the polysystemicness of Firthian phonology. For instance, in a structure such as C_1VC_2, different systems would operate at C_1 and C_2. A systemic treatment could generalize these to one consonantal system and handle the differences in potential between the two by means of preselection.

and adverbial group at Adjunct. There is thus no place where the primary classes are alternative terms in a system. However, once the grammar is given a paradigmatic base (Halliday, 1966), systems are no longer tied to particular places in structure and the theory does not prevent the formulation of a single system network that is not 'placed' anywhere syntagmatically.

If the grammar is a single network grammar, the first two steps in delicacy have a special status. They systemicize the notions of rank and primary class. The first step is **rank** and the next step is **(primary) class**, one for each rank, as shown in the diagram below:

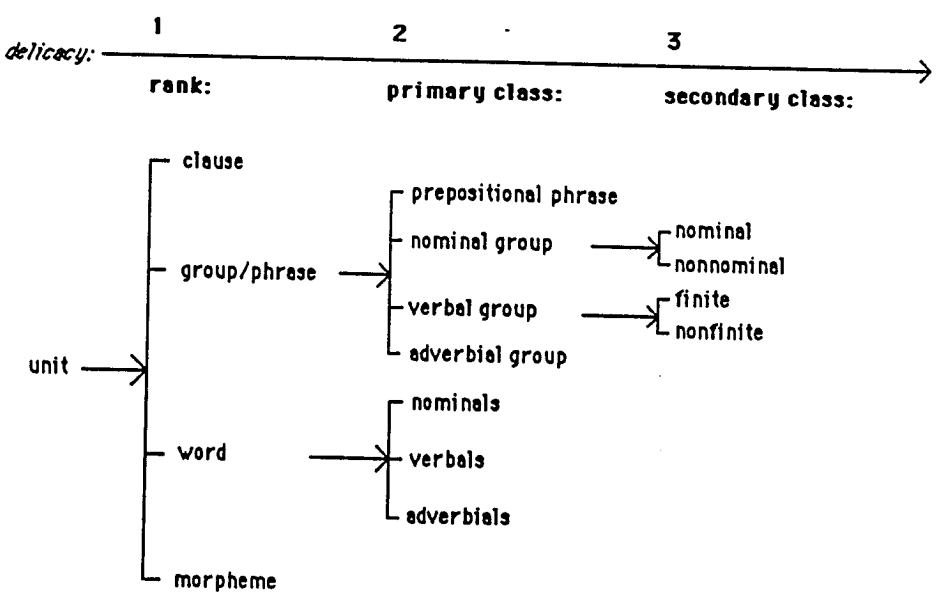


Fig. II:1.2-21: Rank and primary class in a single-network grammar

At clause rank, the system for CLAUSE CLASS is clause / clausette (major clause / minor clause); at group/phrase rank, the primary classes are nominal group / verbal group / adverbial group / prepositional phrase; and so on.

1.2.1.4.2.2 Intermediate ranks; rankshift

At present, both rank and primary classes for each rank are represented by one system each; they are one-dimensional. Consequently the network fragment showing these systems is essentially like the one shown above; the RANK system has the features clause / phrase-group / word / morpheme. However, there are two properties of the rank scale that might be addressed by changing the systemic treatment of it in a single network grammar. They both involve 'movements' along the rank scale -- (i) intermediate ranks and (ii) rankshift; they are diagrammed below.

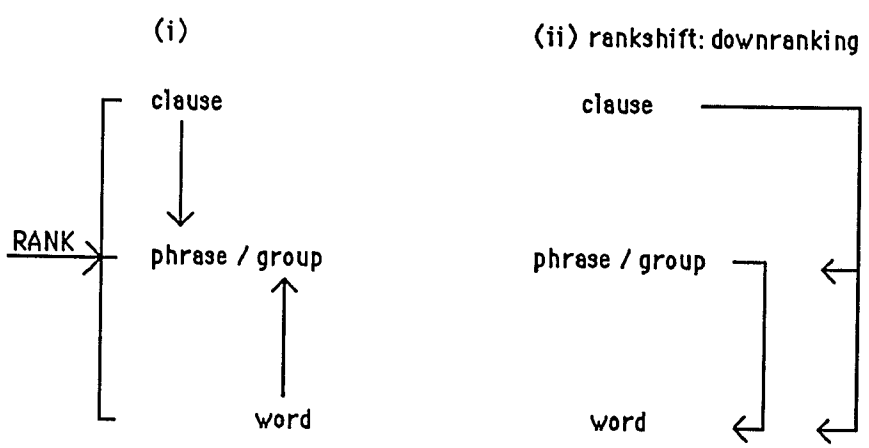


Fig. II:1.2-22: Movements along the rank-scale

(i) Intermediate ranks

One has to do with the nature of the rank between clause rank and word rank. Halliday identifies it as the group-phrase rank and suggests that it is related to both the clause and the word (Halliday, 1985):

> ... a group is in some respects equivalent to a WORD COMPLEX -- that is, a combination of words built up on the basis of a particular logical relation. That is why it is called a GROUP (= 'group of words'). It is also the reason why in the western grammatical tradition it was not recognized as a distinct structural unit: instead, simple sentences (that is, clauses, in our terms) were analysed directly into words. ... A PHRASE is different from a group in that, whereas a group is an expansion of a word, a phrase is a contraction of a clause. Starting from opposite ends, the two achieve roughly the same status on the rank scale, as units that lie somewhere intermediate between the rank of a clause and that of a word. (p. 159) ... a group is a bloated word, whereas a phrase is a shrunken clause. (p. 192)

Whether or not one accepts Halliday's account, it points to an area of English grammar where one might feel inclined to use simultaneous systems rather than a single one. I will illustrate this observation by giving an example from Hudson's (1976) grammar, which is multi-dimensional in the area of rank and primary class. The purpose is not to argue that a specific grammar, say the Nigel grammar, should adopt a multi-dimensional approach, but rather to illustrate the range of possibilities and consequently the range of issues raised that become accessible in a single network grammar.

In his Daughter Dependency Grammar (Hudson, 1976), Hudson proposes that an item is simultaneously classified by three systems -- ±sentence,

±phrase, and ±nominal, as set out in the figure below.

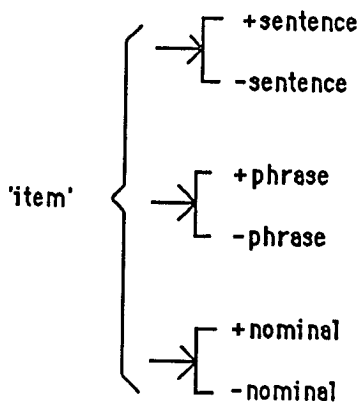


Fig. II:1.2-23: 'Rank' and 'primary class' in Hudson (1976)

That is, instead of one systemicized rank scale sentence - phrase - etc., Hudson sets up two systems; and instead of restricting the primary class system ± nominal to phrases, he generalizes it to all types of units. These moves are, of course, only possible in a single network grammar. The paradigm generated by the three systems is tabulated below.

	+ sentence		- sentence	
- phrase	main clause rel. clause (incl. participial & inf.)	noun clause (other than gerunds: *for-to, that, wether*)	expletive *it, there*	other words
+ phrase	?	gerund clause	noun phrases	adv. phrases prep. phrase (?)
	- nominal	+ nominal		- nominal

Fig. II:1.2-24: The intersections in Hudson's (1976) treatment

The "unmarked" combinations of ± sentence and ± phrase are represented by bold boxes. (The combination of the two minus options is the residue and is not really marked.)

I have noted that the intermediate status of the group / phrase rank may lead to multi-dimensional treatments. There is another potential source: the 'play' on the grammatical system represented by grammatical metaphor. For instance, it is possible to interpret nominalizations such as *the traversal of the system network* as being, in some sense, simultaneously clauses and groups: it has the transitivity structure of a clause but the modification structure of a group (rather than the mood structure of a clause). The single network approach to the paradigmatic organization opens up the possibility of having simultaneous systems in this area of the grammar so that the classification is multi-dimensional rather than one-dimensional. The phenomenon of grammatical

metaphors such as nominalization will be discussed in detail later in Section II:3.3.

(ii) Rankshift

The second kind of movement along the rankscale is *rankshift:* a unit of a particular rank is downranked (downgraded) to serve as if it had a lower rank. I will use the so-called headless relative clause as an example. Traditionally -- i.e., in terms of scale & category theory, such a relative clause would be represented as serving as a rankshifted clause at the Head of a nominal group, contrasting with a ranking noun serving as Head:[12]

clause	Subject	Subject
group	[nominal group]	[nominal group]
	Head	Head
word	[noun]	⟦clause⟧
	letter	*what Henry wrote*
	(i) ranking noun	(ii) downranked clause

Fig. II:1.2-25: Example of rankshifted clause

[12] If this analysis is adopted, the term headless relative clause is thus inappropriate. That is, rather than being headless, the relative clause serves as Head of the nominal group, not as postmodifier (Qualifier).

There are various ways of handling rankshift in a grammar such as the Nigel grammar. If an approach like Hudson's is adopted, rankshift can be treated by means of co-classification, since rank is not represented as a single system. For example, a rankshifted clause serving as a group can be classified as both sentential and phrasal -- +sentence, +phrase.

However, there is an alternative approach to rankshift that also relies on the grammar being represented as a single system network but retains rank as one system. The principle is very simple: the systems in the clause fragment of the system network can be reached either in the normal fashion by selecting clause in the RANK system; or they can be reached from within the nominal group through the selection of the feature rankshifted clause. I have exemplified this strategy below for the systems material / mental / verbal / relational and subject-wh / nonsubject-wh.

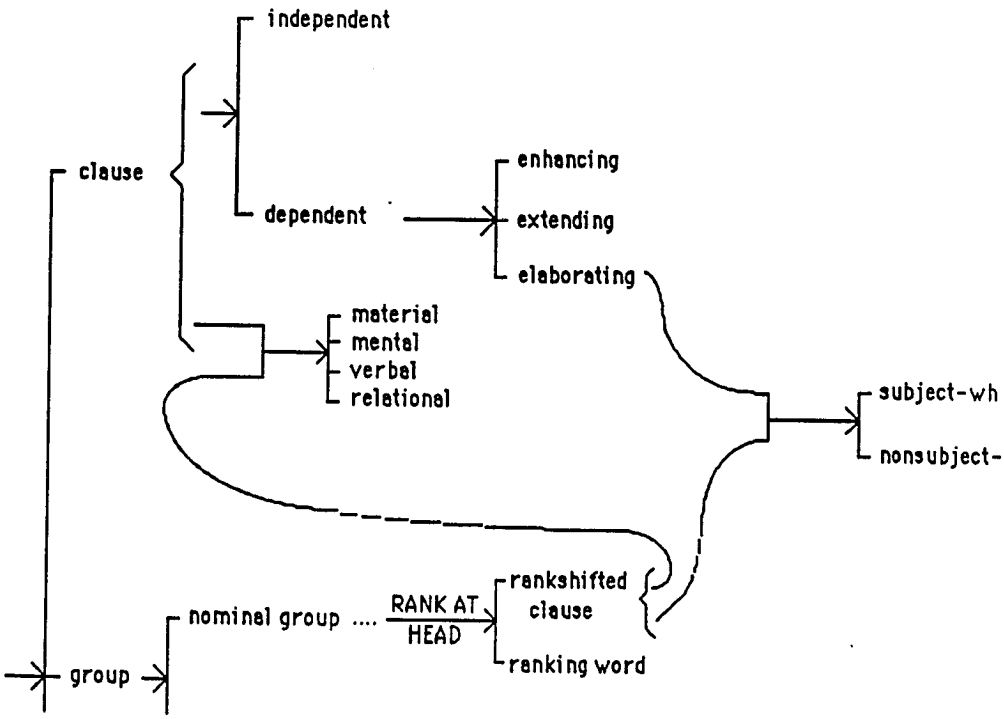


Fig. II:1.2-26: Rankshift as an option in a single network grammar

In generation, the expected realization may be an ordinary nominal group, as in *I read the letter*; but if the option 'rankshifted clause' is selected, we are shifted into the grammar of the clause and we may get *I read what Henry wrote.*

~*~*~*~

It is also worth noting cases of units with a single element of structure realized by a unit at the rank next below: the grammar is normally re-entered to realize the elements of a unit, but in a single network grammar it is also possible to handle the situation by wiring in the network if there is only one element of structure. For instance, minor clauses (clausettes) may be calls, in which case, there is one element of structure, Vocative, which is realized by 'nominal group' (as in *Henry!*). Instead of positing this element, we could let the feature 'call' be an entry condition to nominal groups or a subclass of nominal groups in a single network grammar.

1.2.1.5. The system network as principle of organization

As we have seen, the Nigel grammar and systemic grammars in general have a paradigmatic base. Since the systemic network represents the paradigmatic organization, this means that *the system network is the fundamental organizing principle of the grammar.* It is the locus of three additional types of specification:

(i) 'alongside' the system network: the organization of the other axis, syntagmatic organization, is specified by means of realization statements associated with features. In this respect, the grammar contrasts with one operating by means of independent[13] syntagmatic rules such as phrase structure rules.

[13] They are independent in the sense that they are not conditioned by particular paradigmatic contexts.

(ii) 'above' the system network: the organization of the semantic stratum above the grammar is handled by means of choosers associated with systems. In this respect, the model contrasts with one in which the semantic stratum is represented by a global network.

(iii) 'through' the system network: the generation algorithm is essentially organized in terms of the system network; the major component is an algorithm for running through or traversing the system network.

The three additional specifications are diagrammed below.

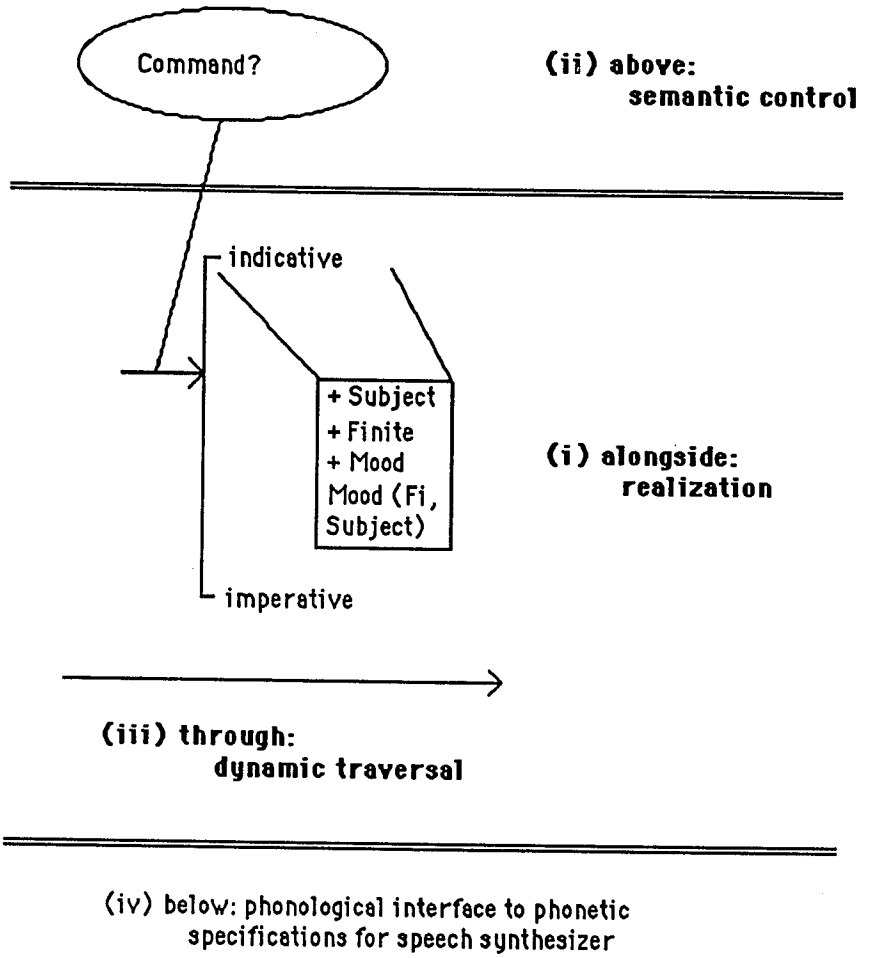


Fig. II:1.2-27: In and around the system network

(We can also note another stratal addition, below the system network: if we were building a speech generation system, we would need to specify a phonological interface to the phonetic specifications needed by a speech synthesizer.) I will say a few words about the first two of these additions in this section, anticipating the presentation in Sections II:1.2.2 and Chapter III,

respectively. Then, I will discuss how the system network guides the generation algorithm in Section II:1.2.1.6.

1.2.1.5.1 'Alongside' the system network: realization statements

Any feature in a system network may have an associated **realization statement** specifying a fragment of syntagmatic organization. The feature constitutes the paradigmatic context for the realization statements associated with it. Recall the system network presented in Section II:1.1.4. We can now use it as an example of the paradigmatic base for syntagmatic specifications. Realization statements are written inside boxes in the diagram in Figure II:1.2-28. (I have left out the systems PROCESS TYPE, RELATION TYPE, and RELATIONAL AGENCY from Figure II:1.2-7 above.)

As noted, a realization statement specifies a structural fragment in the context of a feature of the system network. For example, the feature 'indicative' has the realization statement +Subject, which means 'insert the grammatical function Subject' and ensures the presence of Subjects in indicative clauses. Other realization statements are also specified like this in the context of system features.

There are a number of different types of realization statement -- insertion, conflation, preselection, ordering, etc.. I will discuss the details of these different types in Section II:1.2.2, but it is important to note here that each type specifies a single structural relation. In particular, the ordering of two functions, such as

Subject ^ Finite ('order Subject before Finite'), is separated from the specification of their presence (+ Subject, 'insert Subject').

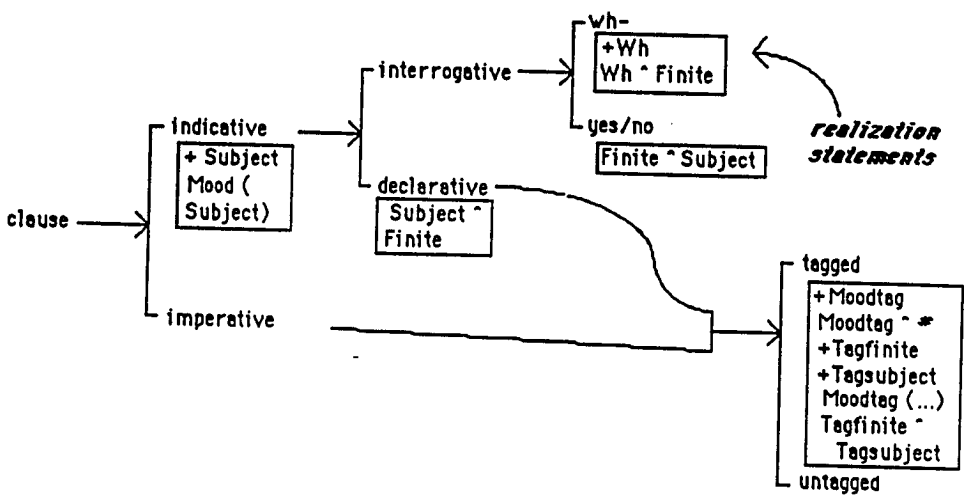


Fig. II:1.2-28: System network with realization statements

1.2.1.5.2 'Above' the system network: choosers and inquiries

Semantic control is organized in terms of the grammatical system network: each system has an associated **chooser**. Choosers are drawn as ovals in the diagram in Figure II:1.2-29; the associations to systems are represented by vertical lines. A chooser is a semantic procedure which knows how to make a purposeful choice among the features of the system it is associated with. It

makes the choice by asking one or more questions, called **inquiries**, thus obtaining the information relevant to the decision. Choosers and their inquiries belong to the semantic interface in Nigel. The diagram in Figure II:1.2-29 is thus an enlargement of part of the Nigel box in Figure I-2 in Chapter I. The double line represents the boundary within Nigel between the chooser & inquiry interface and the systemic grammar.

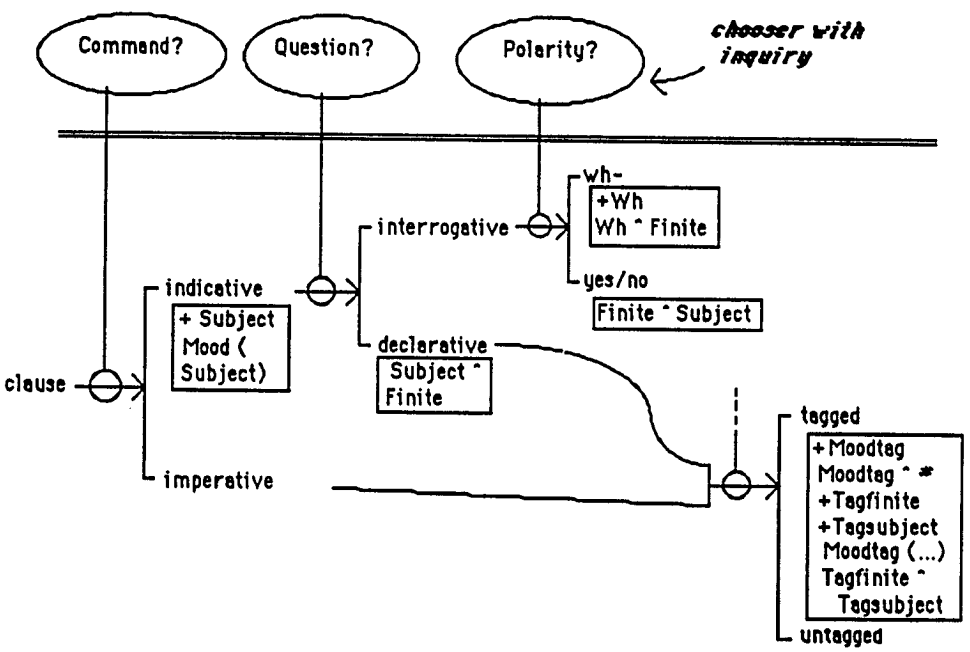


Fig. II:1.2-29: System network with choosers & realization statements

1.2.1.5.3 The accountability of the system network

I have now sketched the semantic and syntagmatic 'neighbours' dependent on the organization system network and we can see that the system network is 'externally' accountable:

(i) 'upwards' accountability: it is stratally responsible, upwards to the semantics; and

(ii) 'sideways' accountability: it is syntagmatically accountable; it must accommodate the realization statements alongside it.

There can be quite a great tension between these two broad categories of accountability. There is pressure on the system network in Nigel from above, because the semantics is grammar-based and is closely related to systemic distinctions in the grammar. At the same time, realization statements have to be absolutely explicit. The pressure is, I think, alleviated by two moves in Halliday's work, in Fawcett's work, and in the Nigel grammar:

(i) upranking of systems like VOICE and TRANSITITIVITY from group or word rank to clause rank so that they can be semantically and functionally responsible and responsive at clause rank: the stratal pressure from 'above' is alleviated by recognizing semantically oriented systems at higher ranks; and

(ii) a functionally differentiated notion of structure rather than only a sequence of classes: the tension between the pressures from semantics and from syntagmatic grammar is alleviated by the introduction of a functionally differentiated conception of syntagmatic organization -- function structure (cf. Section II:1.1.1).

These two moves are important in a text generation grammar; let's look at them in some more detail.

(i) Location of systems: upranking

Traditional grammar was essentially word-based: attention was focussed on morphologically reflected categories such as case, gender, number, aspect, tense, voice; or categories that can be stated in terms of words. Thus, transitivity was essentially verb-based; the central issues are questions such as: is the verb transitive or intransitive; how many complements does it take (govern)? In contrast, systemic grammar is essentially clause-based, which opens up the grammar to a higher degree of functional differentiation than is reflected in word-structure.[14] This functional differentiation greatly helps in the semantic control excercised by choosers (cf. Chapter III).

As an example, consider the distinction in the verbal group between perfective and imperfective aspect, i.e., between infinitival and participial form. Looked at

[14] It also makes it possible to include cryptotypes as well as the phenotypes that come under attention in traditional grammar (using the distinction in the sense of Whorf, 1956).

from the vantage point of word or group rank, there is this single systemic distinction: perfective / imperfective (e.g., *to do / doing*). However, if we take the clause as the vantage point, we find the more functional differentiation; the single verbal group system perfective / imperfective corresponds to a number of functionally distinct systems in the clause, each of which has a pair of features, one of which preselects 'perfective' while the other preselects 'imperfective'. As a result, the realizational move down the rank scale is, in this case, a generalization of a number of distinctions -- diagrammatically:[15]

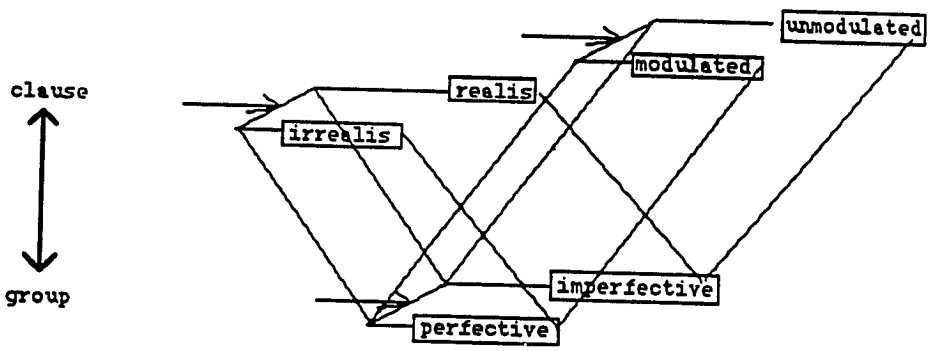


Fig. II:1.2-30: Differentiation (clause) and generalization (group)

For instance, the following clause types have different 'aspect' systems, corresponding to the single verbal group system perfective / imperfective:

[15] We find a similar relation of differentiation / generalization between the semantic stratum and the lexicogrammatical one. I will give examples in Chapter III. Both the stratal move from semantics to lexicogrammar and the move down the rank scale thus entail generalizations from categories specific to certain contexts to cross-contextual categories.

(i) rankshifted, elaborating clause [restrictive relative clause]: modulated / unmodulated

(modulated:) The man *to do* the job is Henry 'who can/should do'

(unmodulated:) The man *doing* the job is Henry 'who does/is doing'

(ii) dependent, enhancing clause: irrealis / realis

(irrealis:) Henry left to rehearse his part

(realis:) Henry left rehearsing his part

Here are some further examples of clause contrasts other than the two mentioned above:

(iii) dependent, extending clause: opposition grammatically conditioned by a connective such as *rather than* and *instead*

Rather than leave, Henry rehearsed in the kitchen

Instead of leaving, Henry rehearsed in the kitchen

(iv) rankshifted, 'act' clause as serving as Phenomenon in perceptive clause: bounded / unbounded

(bounded:) We saw Henry leave when we arrived

(unbounded:) We saw Henry leaving when we arrived

(v) rankshifted. 'act' clause as Subject:

To be or not to be is the question

Being at home all day is not the problem

In a traditional grammar, we would have to try to come up with an abstract pair of semantic glosses for the group distinction perfective / imperfective reflecting the degree of generalization the distinction embodies and we would also have to list the various uses of the forms out of their clause contexts. Similar examples could be given from TENSE, VOICE, TRANSITIVITY, PERSON, and so on.

(ii) Syntagmatic organization: function structure

The functional differentiation in the system network of the clause is often reflected in the syntagmatic organization. For instance, the PROCESS TYPE distinctions (material / mental / verbal / relational) correspond to different

function structures such as Actor Process Goal, Senser Process Phenomenon, and Token Process Value. These differences in function structure are generalized, or rather may be generalized,[16] in the syntagm of classes of groups (cf. Section II:1.2.1.1.1 above). Thus, the syntagm 'nominal group fl verbal group fl nominal group' may correspond to a number of different function structures:

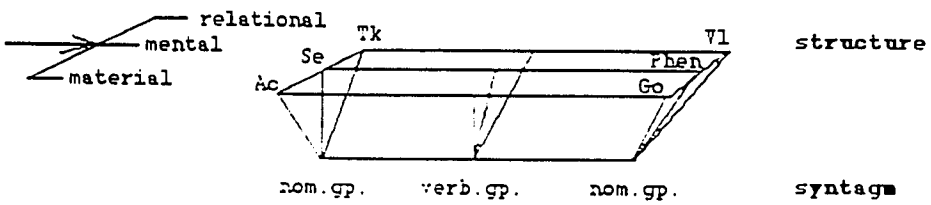


Fig. II:1.2-31: Different function structures relating to systemic distinctions

The differentiation is crucial to the Nigel generator, since semantic associations are established in the first place for the differentiated set of functions such as Actor, Senser, and Token rather than for generalized classes such as nominal group. For instance, there are different inquiries for identifying Actor and Senser.

[16] The functions may, in fact, be realized by classes in different ways. Thus Goal is realized by nominal group (as in *he shook their hands*), while Phenomenon is realized by nominal group or clause (as in *he regretted it / he regretted that he had acted rashly*).

1.2.1.6 Dynamic model: generation algorithm

Having dealt in some detail with the system network at rest, I will now turn to the actualization of it: to use the system network and the grammar in general in generation, we need a dynamic model of how to activate the grammar. This model will be represented by a generation algorithm, which controls the successive generation of grammatical units.

1.2.1.6.1 Overview

We know what the 'scales and categories' of the grammar at rest are. The question is what the basic abstractions of a dynamic model are. We have much less experience to fall back on in linguistics. Indeed, this is an area of systemic theory that has been 'targeted' for development (cf. Martin, 1985; and Halliday, 1985). All I can hope to do at this stage is point to some of the abstractions we will have to take account of, as I discuss the generation algorithm.

The underlying assumption is that there is a distinction between grammatical resources -- the potential -- and the process of actualizing the grammar -- the generation algorithm: cf. Section I:1.1 and II:1.1.1 above. Furthermore, the process will yield products, i.e. new states, recorded in the course of the actualization (for instance, the growing structure is recorded on a 'blackboard'). The three aspects of generation are diagrammed below.

potential	actualization (process)	actualized (product: recorded states)

Fig. II:1.2-32: The three aspects of generation

The subprocesses will essentially be organized in terms of the potential and will be differentiated according to the various aspects of the potential. Their primary task is to activate the potential and to record the resulting state. They thus refer to the potential but they also operate on the resulting states to keep track of the state of progress in activating the potential and to change one state into another by adding further specifications. (No records are ever changed other than by the addition of specifications nor are parts of records ever erased.)

In addition to to the differentiation of subprocesses according to task, we need to specify how subprocesses are ordered. A number of orderings will be determined inherently in terms of the organization of the potential, such as the partial ordering of systems in the system network, by a producer-consumer kind of logic: producers come before consumers. For instance, features have to be selected before they can be realized. However, the potential underspecifies the ordering of generation processes. Thus, while systems are ordered by the system network and have to be entered according to that ordering, they are only partially ordered since they may also be simultaneous. Furthermore, while relative ordering may be determined, the immediacy of the succession is not. For instance, realization may be immediate (follow immediately after the

selection of a feature) or it may be delayed to some later point.

The underspecification of the ordering of generation processes by the potential is not a drawback at all but rather a very important opportunity for parallelism in generation; see further below. The current generation algorithm is a sequential one and we have to impose sequential orderings even where they are not inherently necessary.

We can divide the generation algorithm into two major processes[1], viz.:

(i) **grammar entry:** the grammar is entered for each unit (clause, nominal group, etc.) to be generated; each grammar entry is followed by (ii);

(ii) **grammar traversal:** the grammatical system network is traversed, which means that systems are entered and features are selected, and in the course of this traversal choosers are activated and realization statements are executed.

The generation process is summarized diagrammatically below.

[1] I'm assuming that the generation algorithm is grammar-based. The possibility of a semantics-based generation algorithm will be discussed in Section III:4.6.

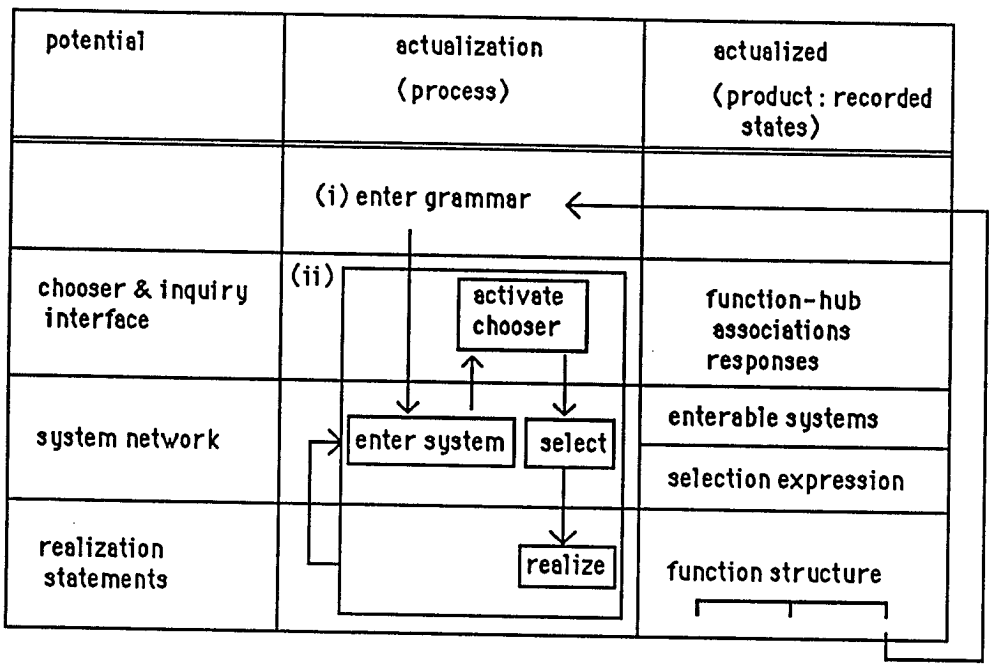


Fig. II:1.2-33: Grammar entry and traversal in generation

When the grammar has been entered (grammar entry: (i)), the grammar traversal is started (ii). The first system whose entry condition has been satisfied is entered, and then its chooser is activated. The chooser obtains the information needed to select one of the features of the system. Once the feature has been selected, any associated realization statements are executed. This process of system entry continues until the system network has been fully traversed and all enterable systems, i.e. all systems whose entry conditions have been satisfied, have been entered. When the traversal has been completed, the grammar can be re-entered for each constituent that has been generated.

I will now discuss the generation algorithm in some more detail.

1.2.1.6.2 Grammar entry

In order for the grammar to be traversed, it has to be entered first. Each grammar entry corresponds to one grammatical unit and one grammar traversal. The general principles determining grammar entry are as follows.

(i) Grammar entry is rank-descendant; it is ordered by the rank scale and proceeds down this scale. When more than one unit of the same rank is waiting to be developed, the grammar is entered again and again (serially, not in parallel) to develop them in linear sequence from left to right.[2]

The rank-descendant approach contrasts with a rank-ascendant one; the first is 'top-down' and the second is 'bottom-up'. The choice of the rank-descendant approach is quite natural in a functional, clause-based grammar as opposed to a word-based one. Since the clause is the point of entry in the interpretation of the grammar, it is the most functionally revealing unit. Furthermore, decisions at clause rank have consequences for decisions further down the rank scale; in general, constraints (stated as preselections) are rank-descendant.

(ii) The grammar is only re-entered after a grammar traversal has been completed; entry and traversal are not interleaved.

[2] It's possible to explore potential consequences of proceeding breadth-first or depth-first; I won't pursue the difference here.

1.2.1.6.3 Grammar traversal

The heart of the grammar traversal is the system entry that controls the traversal of the system network itself. Within the system network system entry is followed by feature selection, but there are two other aspects of the grammar traversal, corresponding to the additions above and alongside the system network discussed in Section 1.2.1.5: chooser activation ('above') and realization ('alongside'). The traversal process is diagrammed below as a sequence of cycles of system entries, accompanied by chooser activation and realization.

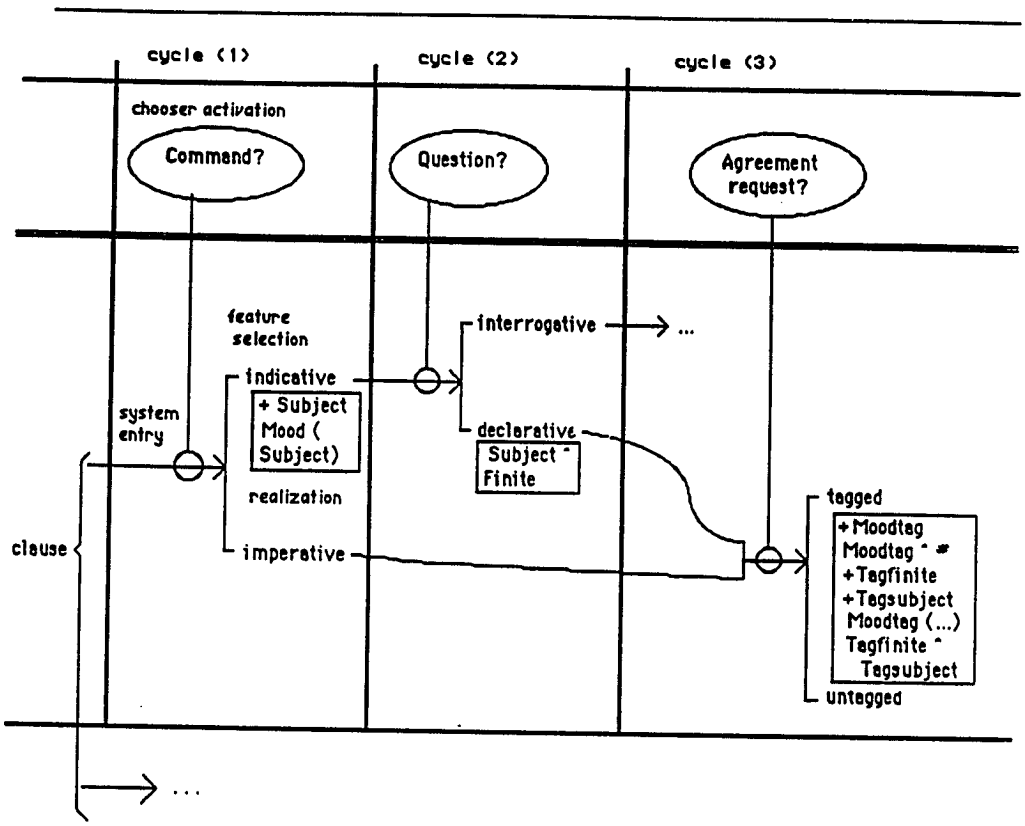


Fig. II:1.2-34: Successive cycles of system network traversal

System entry. The general bound on the traversal algorithm are set by the organization of the system network. The traversal has to abide by the partial ordering of the systems of the network. As far as partially ordered systems are

concerned, there are two principle alternatives we can adopt for the traversal algorithm:

(i) delicacy-increasing: traversal of systems from least delicate towards most delicate in the system network -- what we might also call forward chaining;

(ii) delicacy-decreasing: traversal of systems from most delicate to least delicate in the system network -- what we might also call backward chaining.

In general, the traversal in Nigel is delicacy-increasing.[3] Since the systems are only partially ordered, the delicacy-increasing principle leaves the traversal algorithm underdetermined: whenever systems are simultaneous, the system network does not impose any restrictions on the traversal sequence. As long as the computational implementation of the traversal has to be serial (sequential) rather than parallel, the algorithm designed for the traversal of the network simply has to pick one system at random when there are two or more simultaneous ones available. There are thus two general principles for the traversal algorithm that derive from the system network itself:

(i) Proceed towards increasing delicacy;

(ii) Whenever there are simultaneous systems available, pick one at random.

[3] The delicacy-decreasing direction is used when a feature has been preselected and the path to it has to be computed -- so-called path augmentation. This happens when the grammar has been entered but before the system network is traversed towards increasing delicacy: the point of this precomputation is to guide the normal network traversal. I will return to the possibility of using delicacy-decreasing traversal at the lexicogrammatical stratum in Section III:6.

Chooser activation. When a system is entered during the network traversal, its chooser is activated. Chooser activation is thus determined by system entry. (The alternative would be to give more independent control to generation at the semantic stratum: see Section III:6 below.)

Feature selection. When the chooser of a system has obtained the information needed to make a choice, one of the output features of the system is selected.

Realization. The feature selected may have one or more realization statements associated with it. There are two alternative orderings of the execution of realization statements:

(i) immediate realization: as soon as a feature has been selected, any associated realization statements are executed;

(ii) delayed realization: realization statements are not executed until after the traversal of the system network.

The approach of immediate realization is taken in Nigel: when one of the features of a system has been selected by its chooser, any associated realizations statements are executed.[4] This has the advantage that any potential problems can be caught immediately, in the context of the system network traversal.

[4] Currently, ordering statements are collected and executed after the traversal of the system network.

These are the considerations underlying the design of the traversal algorithm and I can now present it in more detail. The traversal algorithm is diagrammed below. The columns correspond to different 'levels' of processing -- chooser activation, system entry and the traversal of the system network itself, and realization. The records of the changing states are presented to the right of the processes. (The boldface numbers in square brackets, [1] through [4], identify opportunities for parallel processing and will be discussed in Section II:1.2.1.6.4.)

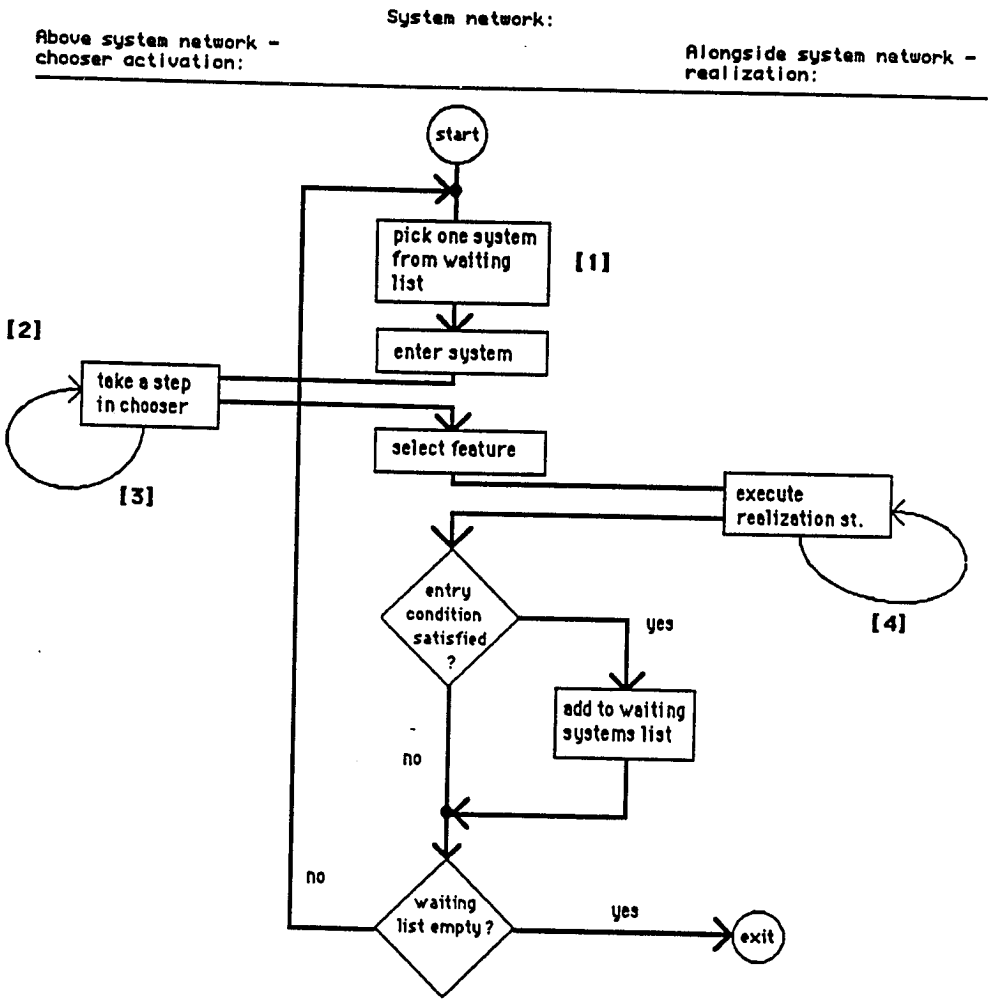


Fig. II:1.2-35: Sequential traversal algorithm

The traversal algorithm of the systems networks starts by **picking one system** from a list of systems whose entry conditions have been satisfied and which are thus waiting to be entered. It does not matter which system is picked from the waiting system list; the result is independent of the order in which the systems are selected and entered.[5] The first system on the list is always the RANK system whose entry condition is satisfied by the feature 'start', which is the root of the system network. The system picked becomes the current system.

The next step is to **enter** the current system.

Next, **the chooser** takes over; it is in charge of selection. The chooser is itself a decision tree with certain additional operations, which is traversed one step at a time until a choice has been made.

The outcome of of the chooser activation is **feature selection.** Features selected during the traversal are recorded in the selection expression.

Once a feature has been selected, any **realization** statements associated with it are executed.[6] These executions are recorded on a 'blackboard'. During the network traversal, the specification of the structure of the unit grows on this blackboard. (Nothing can ever be erased or changed on the blackboard; only further specifications can be added.)

[5] Henrici (1966: Section 5.3) discusses the possibility of "extrinsic ordering in networks" in the context of accommodating realization statements when the intrinsic entry logic of systems do not order them with respect to one another. The entry order does not affect realization in Nigel and is never manipulated to achieve any realizational effects. However, the order of entry may be constrained because of interdependencies among the choosers of systems; cf. Section III:3.1.1.

[6] However, realization statements involving ordering are executed after the traversal of the system network.

Next, the traversal algorithm goes through an **entry condition test** to see if any new entry conditions have been satisfied by the choice of the new feature. If there are systems whose entry conditions have been satisfied, they are added to a list of *enterable (waiting) systems.*

Once the enterable systems list has been updated (if necessary), the algorithm **checks the waiting system list** to find out whether it is empty. If it is, the traversal of the system network has been completed: there are no more systems whose entry conditions have been satisfied.

As an illustration, let's consider two consecutive cycles through the traversal algorithm. These cycles are illustrated in Figure II:1.2-36.

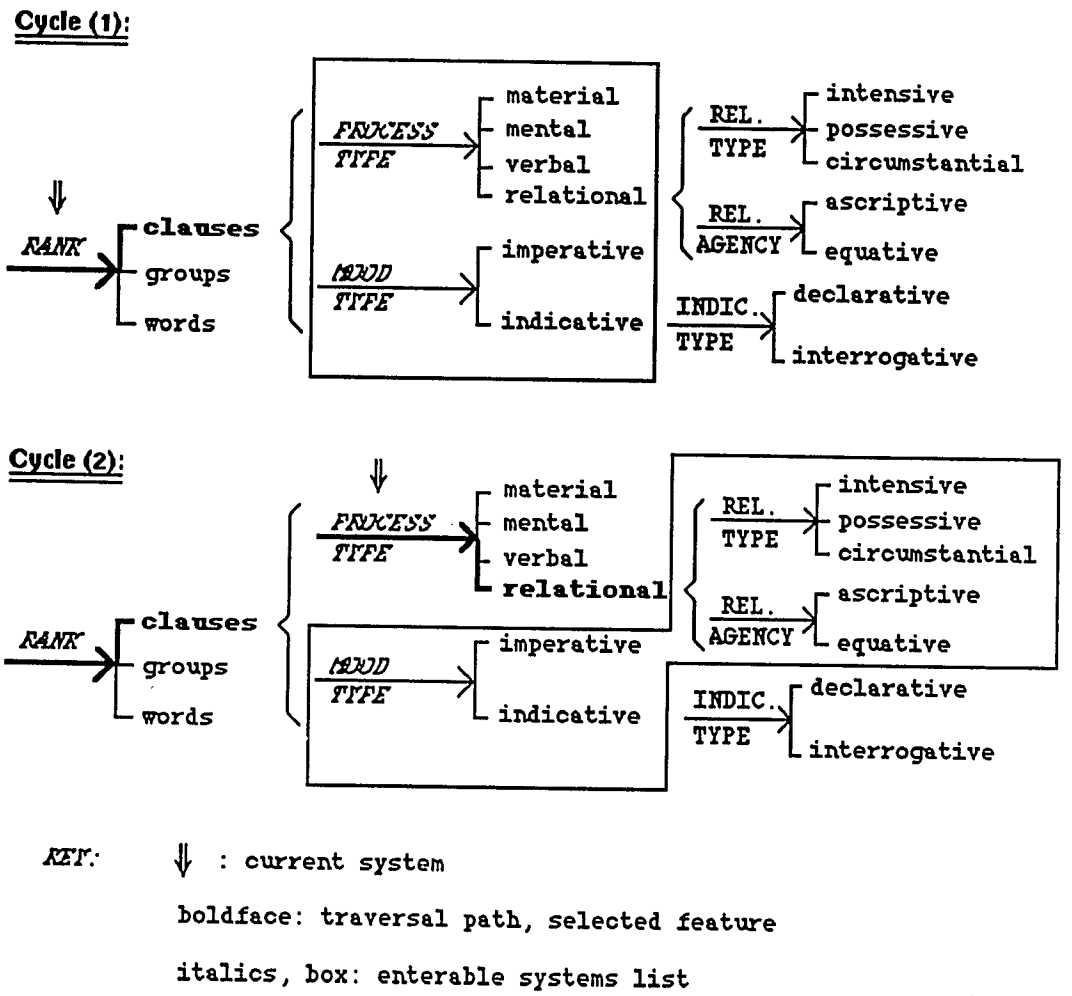


Fig. II:1.2-36: Two successive states of enterable systems

Cycle (1): First, the current system is RANK and the feature clauses is selected. As a result, the systems with clauses as their entry condition, PROCESS TYPE and MOOD TYPE, become enterable and are thus on the list

of waiting enterable systems (in boxes in the diagram). Then, the next system to to be entered, PROCESS TYPE, is picked and it becomes the current system.

Cycle (2): First, the system PROCESS TYPE is entered and can be removed from the enterable systems list. The feature relational is selected. The systems RELATION TYPE and RELATIONAL AGENCY become enterable and is added to the list of enterable systems.

After the selection of a feature, whenever a realization statement such as +Subject, i.e., "Insert Subject", is encountered associated with the feature selected, the statement is executed and the result is recorded on a 'blackboard'.[7] Since there may be more than one realization statement associated with a feature, the realization execution is repeated until all the realization statements have been consumed.

As the clause network is traversed, new features are selected, and the realization statements associated with these features are activated, the clause structure grows one step at a time on the blackboard:

[7] The blackboard metaphor comes from the HEARSAY system developed to control complex processes; the systemic generator itself is not a HEARSAY control structure, however. Once a piece of information has been added to the blackboard by means of a realization statement, it is available to other processes.

new feature	clauses	indicative	declarative	tagged
blackboard	Mood (Finite)	Mood (Subject, Finite)	Mood (Subject ^ Finite)	Mood (Subject ^ Finite) Moodtag (Tagfinite ^ Tagsubject)

Fig. II:1.2-37: Successive states of the Blackboard

When the network has been completely traversed -- when there are no more enterable systems on the list of enterable systems, the full clause structure can be found on the blackboard. In addition to the functional constituents of a function structure, it contains preselections of grammatical features associated with grammatical functions and any lexical items that have already been fully specified. These preselections are instructions to re-enter the grammar to develop the function constituents of the clause as nominal groups, prepositional phrases, and so on. The system network to function structure cycling continues until lexical classes or unique items have been specified for all constituents. The full grammatical representation for *the new system is more reliable than the old one isn't it?* looks as follows.

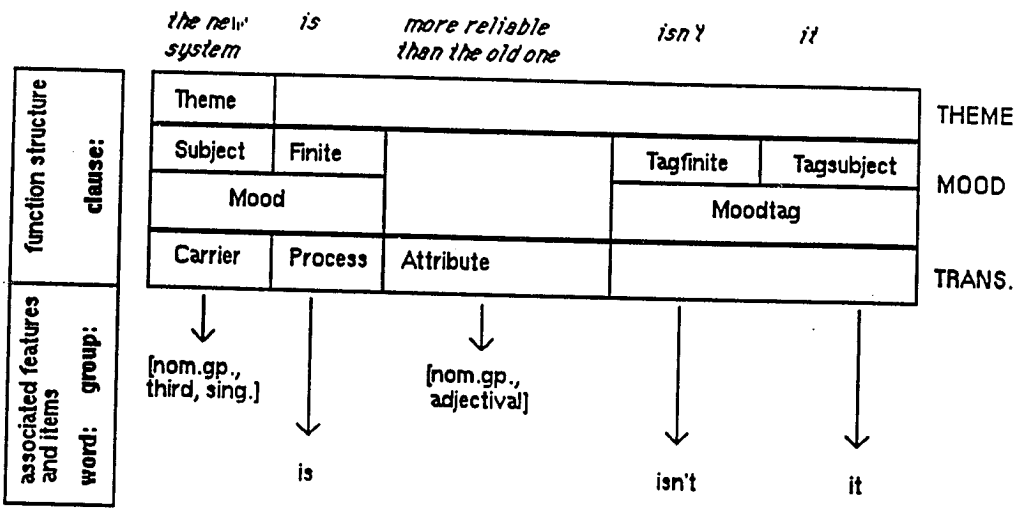


Fig. II:1.2-38: The output structure of an example

The function structure has three layers, one for each metafunctional component. (Textual: Theme; interpersonal: Mood (Subject ^ Finite) ... Moodtag (Tagfinite ^ Tagsubject); and experiential: Carrier Process Attribute.) The associated preselections and lexical items are shown below each functional constituent. For example, the constituent Theme / Subject / Carrier has the preselection [nominal group, third, singular]. The generation algorithm will return to the system network to develop this constituent as a nominal group, which is third person and singular.

1.2.1.6.4 Parallel generation

Having specified the generation algorithm, we can now try to renew the connection with systemic-functional theory. Let's consider how the algorithm treats simultaneous systems: they are picked one at a time for entry and this is in conflict with the assumptions of multifunctionality. Halliday (1978: 134) writes

> ... a linguistic description is not a progressive specification of a set of structures one after the other, ideational, then interpersonal, then textual. The system does not first generate a representation of reality, then encode it as a speech act, and finally recode it as text, as some writing in philosophical linguistics seems to imply. It embodies all these types of meaning in simultaneous networks of options, from each of which derive structures that are mapped onto one another in the course of their lexicogrammatical realization. The lexicogrammar acts as the integrative system, taking configurations from all the components of the semantics and combining them to form multilayered, 'polyphonic' structural compositions.

This points to multi-functional parallelism in generation, but the traversal algorithm sketched above is serial. Only one system at a time is entered even though there may be several enterable systems waiting.

Similarly, chooser actions and the execution of realization statements are simultaneous with the system network as a whole (being above and alongside it) and are not intrinsically ordered with respect to it or one another;[8] the theory separates semantics and grammar and, within grammar, paradigmatic organization from syntagmatic organization. However, they are fully sequenced

[8] That is, while the chooser of a particular system has to operate before a feature in that system can be selected and the feature has to be selected before the realization statements associated with it can be executed, there is no ordering of this chooser or these realization statements with respect to other enterable systems. (In some cases, the entery sequence may be controlled extrinsically; see Section III:4.1.)

in the traversal algorithm. In general, there is no linguistic reason why more than one system should not be entered in parallel nor why actions in the three columns of Figure II:1.2-35 above (the chooser column, the system network column, and the realization column) should not be performed in parallel.

There are, then, significant opportunities for parallel processing (marked as [1] through [4] in Figure II:1.2-35 above):

(i) within the system network: simultaneous systems can be processed in parallel, giving the traversal metafunctional breadth;

(ii) across strata and axes: choosers, systems, and realization statements can be processed in parallel;

(iii) within the chooser & inquiry level: chooser steps that are not ordered can be processed in parallel; and

(iv) within collections of realization statements: realization statements can be processed in parallel.

These possibilities are presented and discussed in more detail in Tung, Matthiessen, & Sondheimer (1988).

1.2.1.6.5 Dynamic potential

At the beginning of this section I said that the dynamic model is represented by the generation algorithm. We need to take a step back now and ask what kind of dynamic model it is.

The generation algorithm is a dynamic model of the *actualization* of the potential, but it is not a dynamic model of the potential itself. The potential is still synoptic -- declarative. There is, as already mentioned, a good reason why it should be. If the potential is synoptic (declarative), it can be used as a common resource by generation procedures as well as by parsing procedures. However, if we put this consideration aside for a while, we can ask whether there is a need to create a model of a dynamic *potential.*

The answer can be explored in terms of the theory of metafunctions. Two of the functions raise the issue of dynamic potential:

(i) the textual metafunction: dynamically defined system terms; and

(ii) the logical subtype of the ideational metafunction: values of system variables, defined dynamically.

(i) In the textual metafunction, we find systems such as THEME SELECTION: unmarked theme / marked theme. If the term 'unmarked theme' is selected, Theme is conflated with Subject (Theme / Subject) in a declarative clause. However, if the term 'marked theme' is selected, there are a number of different

thematic candidates whose specific values are determined by a variety of choices in the transitivity component of the clause grammar. It is hard to anticipate the various combinations of thematic candidates and to state what these choices are by using ordinary systems with statically prespecified terms. Some kind of dynamic system whose potential is allowed to vary according to other choices in the grammar might be one way of approaching the problem. I will return to the issue in Section II:3.2.6.

(ii) I have already touched on the issues raised by the logical metafunction: we have to find a way of handling recursive systems. One possible approach is to consider the whole system to a variable whose values are not pre-specified but are determined on each successive system entry; see further Section II:3.2.4.6.

1.2.2 Syntagmatic organization; realization

1.2.2.1 The notion of realization

As we have seen, the base of the Nigel grammar and of systemic grammars in general is the system network. The system network represents paradigmatic organization but it does not specify grammatical structure, which reflects the general strategy in systemic theory: abstractions such as paradigm and syntagm are differentiated in their representations; they are stated in different formalisms. The abstractions that are differentiated in the theory are related by realization. Realization is the general relationship of predetermination between two strata, two ranks, or two axes; we can identify the following subtypes:

(i) Interstratal realization: semantics realized by lexicogrammar, lexicogrammar realized by phonology. In Nigel, there is an interstratal preselection operator called Choose used to select a grammatical feature in the context of a semantic distinction; for example, if semantic feature QUESTION is selected, *choose* grammatical feature interrogative: if QUESTION, (Choose interrogative).

(ii) Interaxis realization: paradigmatic to syntagmatic or syntagmatic to paradigmatic realization. In Nigel, there are a number of realization statements of this kind. For example, if the grammatical feature indicative is selected, *insert* the grammatical function Subject: if indicative, (Insert Subject).

(iii) Interrank realization: one rank predetermines a lower rank. In Nigel, there is an interrank preselection realization statement. For example, if the feature speaker subject is selected in the clause, the nominal group realizing the Subject is preselected to be first person: if speaker-subject, (Preselect Subject first-person).

The first kind of realization takes us outside lexicogrammar and will be discussed in Section III:2. Here I will focus on interaxis and interrank realization within the lexicogrammatical stratum. These two types of realization serve to build structural specifications:

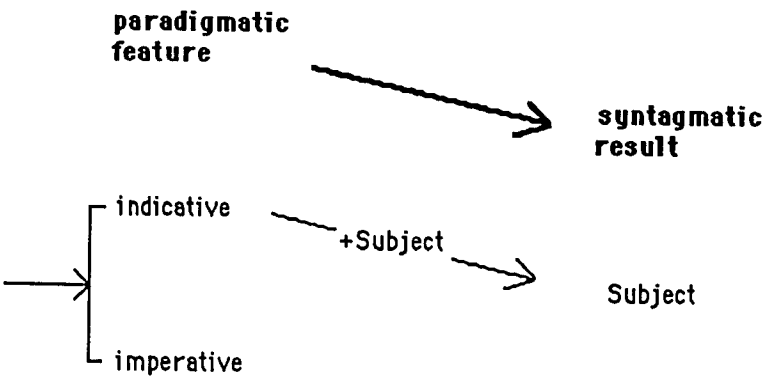


Fig. II:1.2-39: Realization for structure building

One example we have already met is +Subject (Insert Subject): if indicative, insert Subject (abbreviated as 'indicative ↘ +Subject').

Paradigmatic conditioning. Realizations are associated with systemic features, their realization **conditions**. That is, the context in which a realization is applicable and is applied during generation is defined paradigmatically rather than syntagmatically: a feature in the system network is re-expressed (realized) syntagmatically. For instance, we can look at the paradigmatic contexts in which realizations statements involving Subject and Finite are specified. Insertion of the functions (+Finite, +Subject) and ordering of them in relation to one another (Subject ^ Finite, etc.) are stated in different paradigmatic contexts:

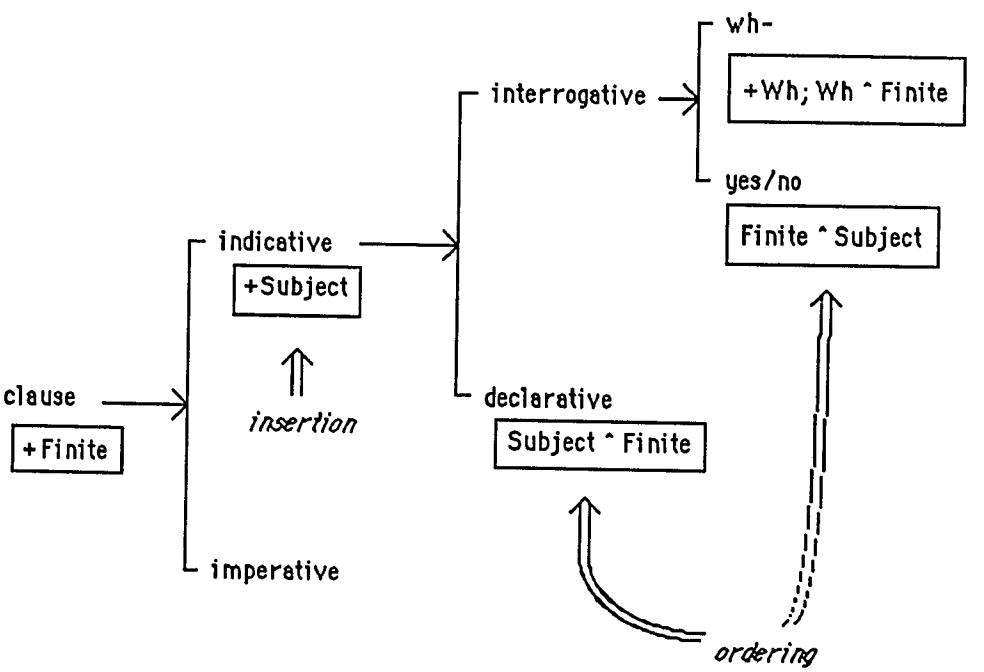


Fig. II:1.2-40: Paradigmatic contexts for realization

The function Finite is inserted in the context 'clause' but it is ordered in the contexts 'declarative', 'yes/no', and 'wh-'. Similarly, Subject is inserted in the context 'indicative' but is ordered in the contexts 'declarative', and 'yes/no'. Insertion and ordering statements thus occur in different paradigmatic contexts. This separation in the specification of structure illustrates a general principle. Realization statements specify 'minimal' aspects of syntagmatic organization; for example:

(i) the presence of a function and its ordering are specified by different realization statements;

(ii) the presence of a function and the nature of its realization are specified by different realization statements; and

(iii) the presence of a function and the identification with other functions are specified by different realization statements.

The example with Subject and Finite illustrates the first observation: the presence of Finite is specified as a realization of the feature 'clause', the presence of Subject as a realization of 'indicative' and different relative orderings of the two in the contexts of 'yes/no' and 'declarative'. The other two observations about separate specifications of presence and other properties are both illustrated in the following example involving the Phenomenon (abbreviated as Phen in the diagram below) in a mental clause.

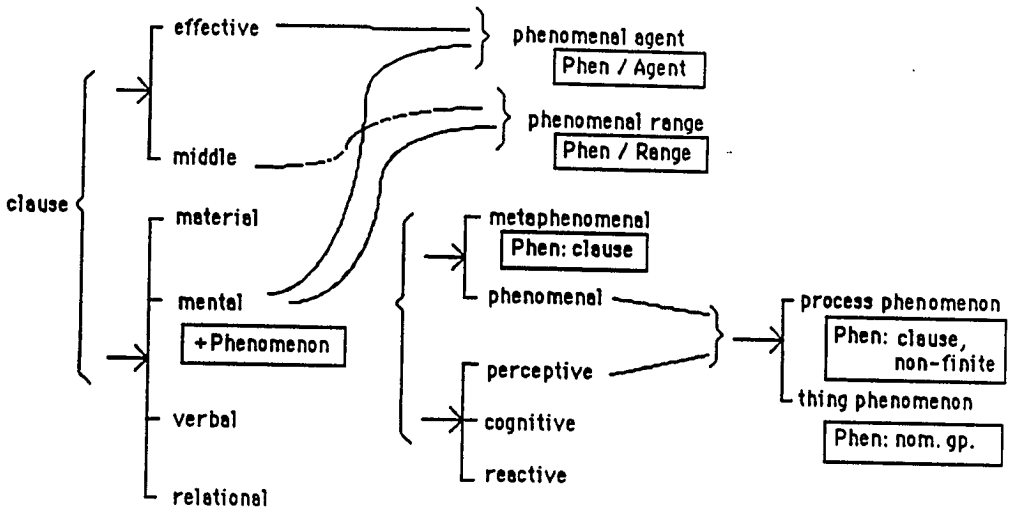


Fig. II:1.2-41: Realizations involving Phenomenon

The function Phenomenon is inserted in the context of 'mental'.[1] However, its conflation with Agent or Medium and the specifications of how it is to be realized are postponed to more delicate paradigmatic contexts. For example, if Phenomen is a process, it is realized by a non-finite clause, as in *we saw him sign the treaty.*

The form of a realization statement. Realizations are given as **realization statements** consisting of one realization **operator** and one or more arguments, which are functions or features. The application of a realization statement produces a **syntagmatic result**; for example:

[1] Not all mental clauses have an explicit Phenomenon, but for the purposes of the example they do.

paradigmatic feature	realization statement		syntagmatic result
realization condition	realization operator	arguments	
declarative	(Order	Subject Finite)	Subject ^ Finite
effective	(Insert	Agent)	Agent
metaphenomenal	(Preselect	Phenomenon clause)	Phenomenon: clause

Fig. II:1.2-42: Examples of realization statements

All realization statements have features as realization conditions. The nature of the operator and the type of argument depend on the specific kind of realization.

There are, as already mentioned, two kinds of intra-stratal realization, viz. (i) interaxis realization and (ii) interrank realization. Both have a function as the first argument of the realization operator, but in the case of interrank realization, the second argument is a feature. The specification given by an interaxis realization is executed within the traversal through the grammar in which it occurs. The specification given an interrank realization anticipates a subsequent cycle and it is not executed until that cycle. These differences are shown in the table below.

	realization statement			syntagmatic result -- executed at
	realization operator	**argument** function	**argument** function / feature	
(i) inter-axis			*function*	*current traversal*
	(Insert	Agent)		Agent
	(Order	Subject	Finite)	Subject ^ Finite
	(Conflate	Agent	Subject)	Agent / Subject)
	(Expand	Mood	Subject)	Mood (Subject)
(ii) inter-rank	(Preselect	Phenomenon	*feature* clause)	*subsequent traversal* Phenomenon: clause

Fig. II:1.2-43: Argument types and cycle of execution

(i) **Interaxis** realization is directed from systemic feature selections to function structure specifications but not from structure to feature: since the grammar has a paradigmatic base, structures are determined by paradigms. It takes the form of realization statements that specify structure fragments in terms of one or two grammatical functions and are associated with features in the system network. For example, the feature declarative in the system declarative / interrogative has the realization statement (Order Subject Finite) associated with it. If the feature is chosen, the realization statement is executed.

(ii) While interaxis realizations are executed fully within one traversal of the grammar, **interrank** realizations are preselections of features at a lower rank and these preselections do not become actual selections until the grammar has been reentered and a subsequent traversal of it has started.

There are two ways of conceiving of the interaxis realization operators. (i) We can think of the operators themselves as being neither paradigmatic nor syntagmatic but as being purely realizational:

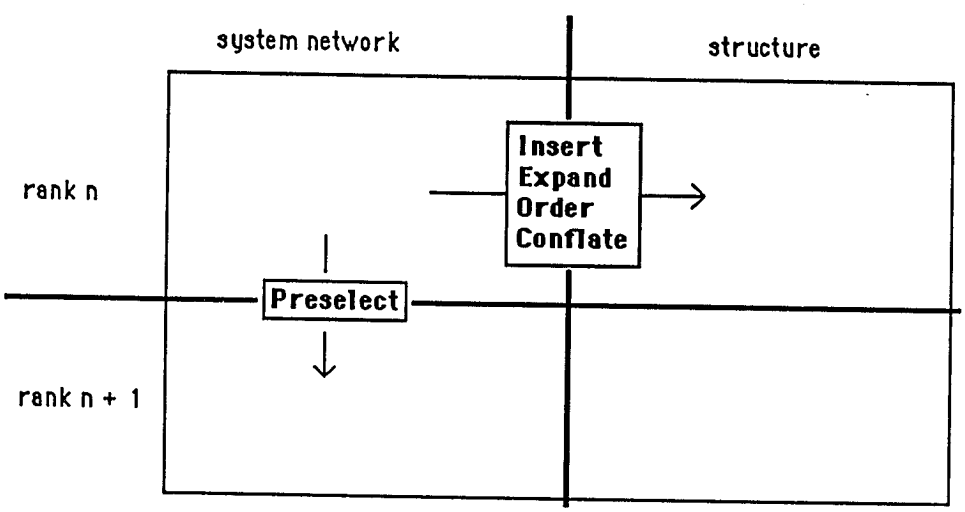


Fig. II:1.2-44: interaxis and interrank realization (i)

(ii) Alternatively, we can think of the conditioned realization statement as being the realization. The conditioning part is paradigmatic and the conditioned part is syntagmatic: interaxis operators can then be conceived of as conditioned structure building rules:

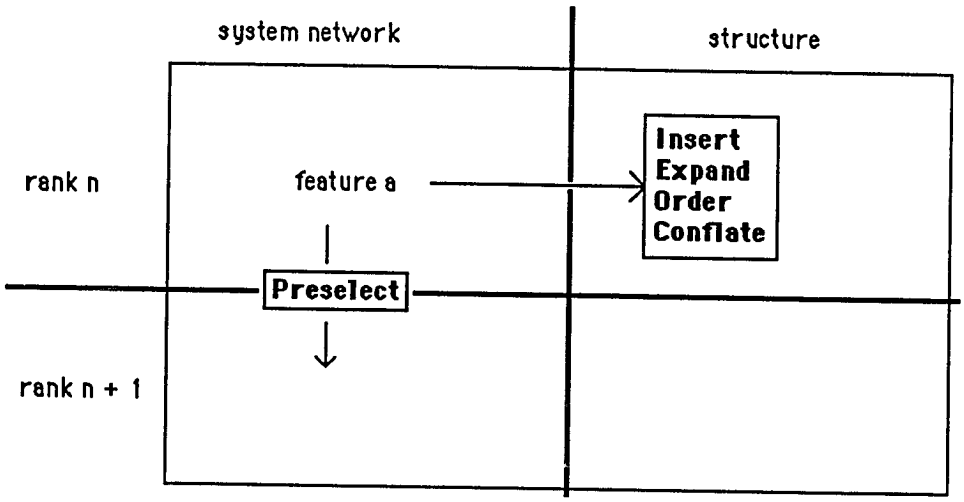


Fig. II:1.2-45: interaxis and interrank realization (ii)

There is a potential difference between the two conceptions: the second makes it possible, in principle, to specify structure independently of the system network, since it allows structure specifications without conditioning systemic features.[2] This strategy might be used to specify *defaults* that are not located anywhere in particular in the system network. At present, the only default mechanism in Nigel is the default ordering statement and its form is different from that of the conditioned ordering statement. That is, all interaxis and interrank realization statements are paradigmatically conditioned at present. Default ordering statements simply consist of lists of functions, e.g. (Process Manner Place Time); see Section II:1.2.2.4.2.3.

The two types of realization statement, interaxis and interrank, operate with two different notions of syntagmatic organization, which were mentioned in

[2] Cf. Fawcett's (1980) notion of starting structure and Hudson's (1971) structure building rules.

another context in Section II:1.2.1.1.1. Interaxis realizations define syntagmatic organization as a configuration of functions whereas interrank realizations refer to grammatical classes. I will turn to this distinction now and the nature of syntagmatic organization in general.

1.2.2.2 On the notion of syntagmatic organization

Before discussing the details of how structure is specified by means of realization statements, let me draw attention to some aspects of syntagmatic organization that will be helpful later on. I will do this in two steps. First, I will discuss Halliday's differention between syntagm and structure and the concomitant distinction between constituency and realization (Sections II:2.1, 2.2 and 2.3). Then, I will consider the layering of structure (Section II:2.4).

1.2.2.2.1 Syntagm and structure

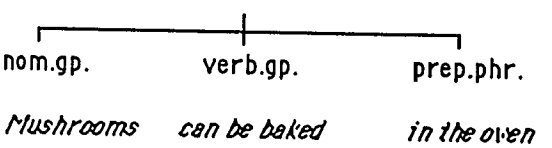
Up to now in this section, I have assumed tacitly that syntagmatic organization is structure, where structure is shorthand for function structure. However, it is, of course, possible to have two notions of syntagmatic organization, as already mentioned in Section II:1.2.1.1.1. Halliday (1966) suggests making a distinction between sequences of classes, **syntagms**, and configurations of functions, **structures**:[3]

[3] More recently, proponents of other grammatical theories have introduced similar distinctions such as constituent structure and function structure in Lexical Functional Grammar (see e.g., Kaplan & Bresnan, 1982: 175 ff). Cf. also Kac's (1978) co-representational grammar.

> In the representation of syntagmatic relations in language, we can distinguish between a linear sequence of classes, such as 'adjective followed by noun', and a non-linear configurations of functions, such as 'modifier-head relation' or simply 'modification'. Both of these have been referred to as 'structure', ... For terminological simplicity we might perhaps here follow one tradition in referring to an arrangement of classes in sequence as a SYNTAGM, reserving the term STRUCTURE for a configuration of functions. If then function-type labels such as 'modifier' are introduced, whether as such or as conventional interpretations of class-type labels, they will not be located in the syntagm, since their defining environment is not stated in terms of (its) sequence. This always holds true even if in a given language (say) a modifier-head structure is always realized as a syntagm of adjective followed by noun; a structure is not defined by its realizations.

For example, the clause *Mushrooms can be baked in the oven* can be represented as (i) a syntagm and (ii) a function structure.

(i) syntagm



(ii) function structure

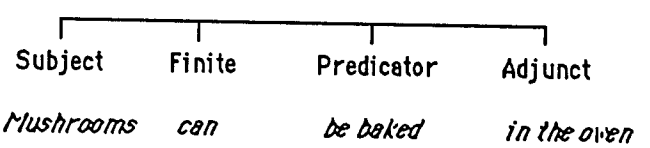


Fig. II:1.2-46: Function structure vs. syntagm

The function structure interprets the example as having four constituents, Subject - Finite - Predicator - Adjunct; in contrast, there are only three classes in the syntagm, nominal group - verbal group - prepositional phrase. The functions Finite and Predicator correspond to the same verbal group. This illustrates an important principle: while terminal functions in the function structure are typically in a one-to-one correspondence with classes in the syntagm, they need not be. I say terminal functions because it is perfectly possible to define functional constituency where non-terminal functions do not correspond to grammatical classes. Halliday's analysis of the mood structure of the clause in English is a case in point.[4] Subject and Finite together form the Mood constituent and while they can both be related to grammatical classes, nominal group and verbal group respectively, the Mood constituent does not correspond to a grammatical class:

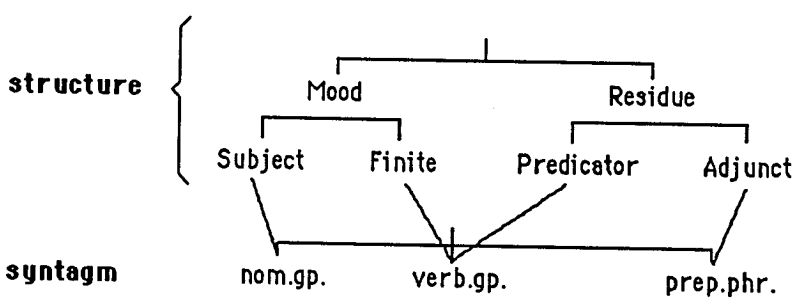


Fig. II:1.2-47: Many to one relation in function to class realization

[4] Similarly, the traditional notion of Predicate in the Subject - Predicate analysis of the clause in grammar and logic did not correspond to a group of words of a particular class. However, Predicate has been reinterpreted as verb phrase, a class notion, in formal grammar.

Non-terminal functions such as Mood that are expanded by other functions cannot be realized in Nigel. For example, it is not possible to classify Mood as nominal group (by means of preselection). Mood and other functions like it are internal to a function structure in this respect.

The function structure of a unit such as the clause makes reference to functions of that unit; Mood, Subject, Finite, etc. are all clause functions. However, the syntagm of a unit such as the clause makes reference to classes of units at the rank below; nominal group, verbal group, and prepositional phrase are all of the group/phrase rank below clause rank. In other words, there is a rank-boundary between a unit and the classes that make up its syntagm.

Now, if the grammar is a single network one (Section I:1.2.1.4), and class distinctions are systemicized (e.g., group/phrase: prepositional-phrase / nominal group / verbal group / adverbial group), as they are in the Nigel grammar, there is no formal distinction between a sequence of classes (e.g., nominal group - verbal group - adverbial group) and a sequence of sets of features (e.g. {nominal group, first-person, singular, nominative} - {verbal group, first-person, singular} - {adverbial group, temporal}). In the context of the Nigel grammar, we can redefine the syntagm as a sequence of feature sets rather than a sequence of classes. The latter is just a special case of the former: the feature sets are singletons and the features all correspond to primary classes such as nominal group and adverbial group.

While function structure and syntagm are independent conceptions of syntagmatic organization and could be specified by different types of

statements, they have to be related to one another. In Halliday's systemic theory, the two stand in a realizational relationship: a function structure is realized by a syntagm. For example, a clause structure -- that is, a configuration of clause function -- is realized by a sequences of classes at group/phrase rank: Subject is realized by nominal group, Predicator by verbal group, and so on. The Nigel grammar reflects this relationship, broadly speaking, but it does not give the syntagm a special status. Only function structure constitutes an independent statement of syntagmatic organization. It is defined by the realization operators introduced in Section II:1.2.2.1 (Figure II:1.2-43). They introduce functions, order them, conflate them, and so on. The syntagm will simply be represented by the preselected sets of features introduced by the interaxis operator Preselect and associated with grammatical functions.[5]

In the current version of Nigel, it is not possible to express formally analyses that introduce differences in the organization of the function structure and the syntagm. For instance, while it is easy to represent the analysis of an example such as *Henry left the room*, where there is a one-to-one relation between function constituents and classes (Subject: nominal group, Finite/Predicator: verbal group, and Complement: nominal group), examples such as *Henry has left the room* analysed as having Finite and Predicator as different constituents realized by one verbal group are problematic. The two are contrasted below:

[5] Contrast for example Lexical Functional Grammar, where the syntagm (c-structure) is an independent statement, defined by means of phrase structure rules.

structure	Mood		Residue	
	Subject	Finite	Predicator	Complement
syntagm	nom. gp.	v.gp.		nom. gp.
	Henry	has	left	the room

Fig. II:1.2-48: Finite, Predicator (structure) and v. gp. (syntagm)

I will return to the issues involved in Section II:3.

1.2.2.2.2 Structure, syntagm, and realization statements

In section II:1.2.2.1, I pointed to the distinction between interaxis and interrank realization statements. As already mentioned, the two different types of realization statement correspond to the two different types of syntagmatic organization. Interaxis statements define function structure and interrank statements introduce realizing features. The two types are summarized below.

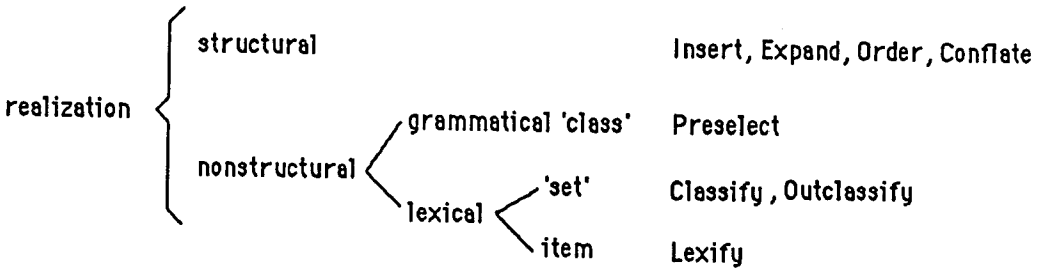


Fig. II:1.2-49: Types of realization statement

1.2.2.2.3 Constituency vs. realization

The distinction between function structure and syntagm has important consequences for global syntagmatic organization. In a formal grammar that operates only with syntagms, there is global constituency. For example, a phrase structure grammar will start with S and relate it by a number of rewriting rules to terminal classes such as Det, N, and V:

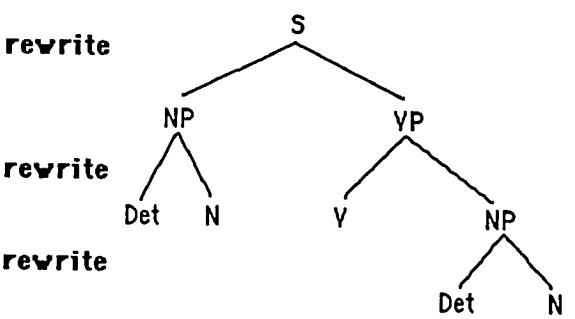


Fig. II:1.2-50: Constituency in syntagm of classes

In contrast, a systemic grammar assigns a function structure to each unit but it does not relate the functions from different units structurally. Instead, the constituent functions of one unit are realized by feature sets referring to classes of units at the rank below. Thus, Insert introduces functions as constituents of one unit while Preselect specifies how these functions are realized. For example:

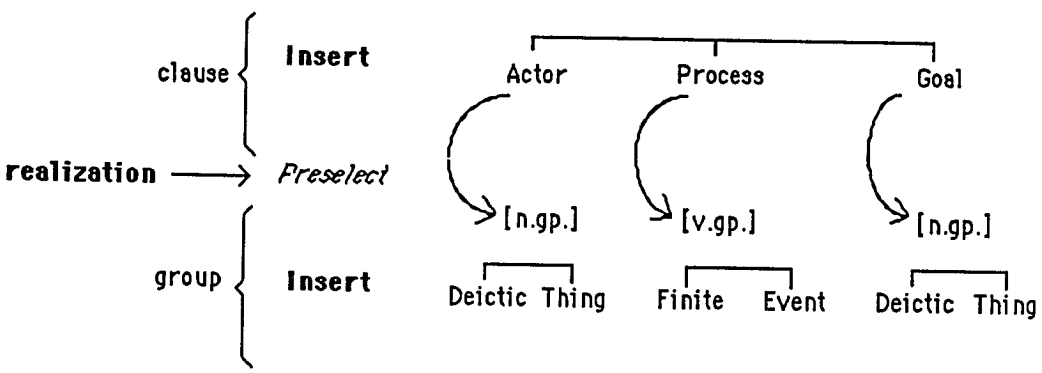


Fig. II:1.2-51: Realization relation between function and class of unit

The distinction between realization and constituency in the specification of structure may seem inconsequential, but there are a number of important reasons for making it, several of which will emerge in more detail later. There is one general negative reason: while formal grammars using phrase structure rules or the like to create constituency need to make reference to structural constituency relations such as dominance and command, there is no such need in a systemic functional grammar. Other reasons are as follows.

(i) There may be a shift between ranks from constituency organization to another mode of syntagmatic organization (to be discussed later) such as interdependency (see Section II:3.2.3), in which case constituency cannot be used to relate the two ranks. For example, ∫ in the structure below is an element dependent on å in a dependency structure but it is not a constituent of the verbal group, so it cannot be a constituent of Process either:

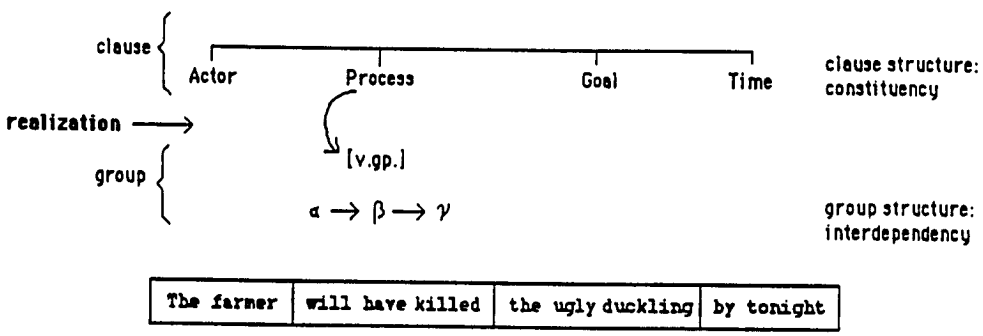


Fig. II:1.2-52: Change in structure type between ranks

(ii) There may not be a unique 'mother'. For instance, phrasal verbs can be analysed as being simultaneously structured as Process (e.g. *put off*) Predicator (*put*) + Adjunct (*off*):

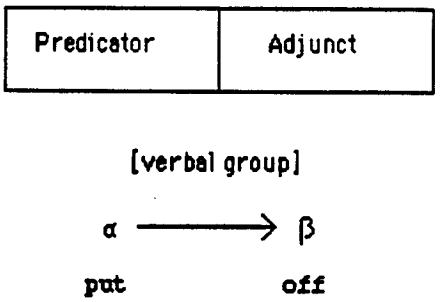


Fig. II:1.2-53: Realization of two constituent functions

Similarly, the constituents of the verbal group would have Process as well as Finite + Predicator as 'mothers' if we assumed a constituency relationship instead of a realizational one.

(iii) In the unmarked case, the structures of units from different ranks do not interact. That is, the structure of each unit is a self contained functional domain and this principle is reflected in the realizational relation but would be obscured if ranks were related by constituency rather than realization. Only functions that are constituents of the same unit can be related by expansion, conflation, or ordering.

For example, the Goal *the ugly duckling* in the example above can be thematic, i.e., it can be conflated with Theme, since Goal and Theme are both constituent functions of clause structure. However, none of the constituent functions of the nominal group realizing the Goal (Deictic: *the*, Epithet: *ugly*,and Thing: *duckling*) can be conflated with Theme, since they are not constituent functions of the clause.

We can conclude, then, that there are good reasons to rely on the relation of the realization cycle to relate the structures of different units to one another.

1.2.2.2.4 Layering: simultaneous constituency

The distinction between function structure and syntagm was present in Halliday (1961) in the sense that a structure was made up of elements such as Subject, Predicator, and Complement and these were realized by classes at the rank next below. That is, structure was a function structure, although the functions were called elements. However, structure proceeded along one dimension only, which I will simply call **structuring**. The structure of the clause was stated in terms of Subject, Predicator, Complement, and Adjunct, which were later interpreted as constituting the interpersonal organization of the clause. Experiential distinctions were included, e.g. in Huddleston (1966), but they were treated as more delicate distinctions of primary structure. For instance, Huddleston (op cit.) differentiates the Subjects of the following examples:

```
John is happy
John hit Peter
John was hit by Peter
```

-- as S^{Attr} (primary Subject more delicately characterized as Attribuant), S^{Act}-

Init (primary Subject more delicately characterized as Actor-and-Initiator), and Subject^{G} (primary Subject more delicately characterized as Goal). In a footnote, he observes:

> rather than consider 'goal' etc. a secondary delicacy superscript that may be attached to S or C, it might be better to consider it a primary function which coincides with S or C but on a different dimension of classification.

It is this second alternative which is supported by Halliday's theory of metafunctions (Halliday, 1967/8), and it was adopted in later work. The different dimension of classification Huddleston refers to is the experiential one and in order to accomodate it and the textual metafunction we have to conceive structure itself as having an additional dimension. I shall call this dimension **layering**. It is the dimension that gives a function structure its "metafunctional breadth" (cf. Section II:1.2.1.2) or 'polyphonic' character to use one of Halliday's metaphors. (Abstractly, the layers of a function structure are like the tiers of an Autosegmantil phonological representation.) The third example can be analysed as having an experiential layer in which *John* is the Goal and an interpersonal one in which *John* is the Subject. Goal and Subject are related by means of the realization operator conflation, Subject / Goal (Conflate Subject Goal). The structural result is diagrammed below.

John	was	hit	by Peter

Theme	Rheme		
Subject	Finite	Predicator	Adjunct
Goal	Process		Actor

Fig. II:1.2-54: Layering

(Note the trade-off between layering and minimal bracketing in a multifunctional grammar and constituency and maximal bracketing in a formal grammar such as a phrase structure grammar operating in terms of grammatical classes; cf. Hudson, 1967; Halliday, 1985: 22 ff.. The Theme - Rheme organization is partly treated as if it were an additional bracketing of classes in formal grammar by introducing S-bar, branching into COMP (cf. Theme) and S (cf. Rheme).)

1.2.2.3 Specifying syntagmatic organization by realization

I have illustrated how realization operators help specify syntagmatic organization. Let me now present this information systematically.

1.2.2.3.1 The three dimensions of syntagmatic organization

To sum up what I have said about syntagmatic organization, a function structure has two dimensions, viz. structuring and layering. In addition, it is related to a syntagm of feature sets at the rank below. Each dimension is defined by one or more realization operators:

(i) **Structuring**: insert, order, expand (Section II:1.2.2.4)

(ii) **Layering**: conflate (Section II:1.2.2.5)

(iii) **Rank**: preselect (Section II:1.2.2.6)

Structuring and (metafunctional) layering define the structure of a unit such as a clause, a nominal group, or a verbal group as a configuration of functions. The functions are realized by units of the rank below, through preselection. The realization operators to be discussed are as follows:

STRUCTURING	(Insert Subject)	+Subject	Function inserted as constituent of the structure of the unit being specified	Subject
	(Order Subject Finite)	Subject^Finite	One function ordered to precede another function	Subject | Finite
	(Expand Mood Finite, Subject)	Mood (Finite, Subject)	One function is expanded to have (an)other function(s) as constituent (s)	Mood Subject | Finite
LAYERING	(Conflate Subject Agent)	Subject/Agent	One function is conflated with another function to form part of the same constituent function bundle	Subject Agent
RANK	(Preselect Subject <u>singular</u>)	Subject: <u>singular</u>	A function is preselected for a feature; in the realization cycle the feature is selected.	Subject [singular]

Fig. II:1.2-55: Inventory of realization statements

1.2.2.3.2 Constraints on realization operators

My presentation of each realization operator is organized into (1) a characterization of it, (2) the result of its application, and (3) a specification of some constraints on it. There are four general constraints that all realization statements follow:

(i) Actuality of execution: actual.

(ii) Domain of application: one unit.

(iii) Compactness of functions: discrete functions.

(iv) Complexity of realization operands: usually simplex.

Let's look at these constraints one by one.

(i) Actuality of execution

The application of realization statement leads to an actual result, not a potential one. There is no way of stating 'potentially inserted / ordered / expanded but not necessarily actually [in this case]'. In this respect, the Nigel grammar differs from Hudson's (1971) grammar, where a certain realization statement may be blocked by a later condition. So, for example, if Subject is inserted by the application of "Insert Subject", it must remain inserted. This

constraint on the actuality leads to a "transparent" grammar in which it is always clear what the final result of a certain realization statement is. The pros and cons of the constraint will be further discussed in Section II:3.1.5.

(ii) Domain of application

The domain of application of realization statements is the grammatical unit, just as it is the domain of functional subcomponents such as transitvity, mood, and determination. That is, realization statements only operate within the domain of the structure of one unit (such as clause structure, nominal group structure, and so on) and within the rank of that unit (clause rank, group rank, and so on) -- with the exception of Preselect statements. That is, the only way of communication between units is through the preselection of grammatical features at the rank below. The domain constraint follows from the way the grammar is based on rank: structure is the structure of the unit of a particular rank and class and different ranks are related by realization, not by constituency. The consequences for the conception of structure were presented in Section II:1.2.2.2.3 above, where constituency and realization were contrasted.

The diagram below in Figure II:1.2-56 illustrates the constraint for the example *The dressing for these can be found in the Salad section.* Each unit is represented by a box diagram of one or more layers; preselections are represented by arrows. All these boxes are generated separately and there is no structural interaction or interference among them. For instance, the grammar

cannot conflate the Subject of clause structure with the Minirange of the second prepositional phrase structure to give us the following undesirable example:

```
The Salad section can be found the dressing for these in.
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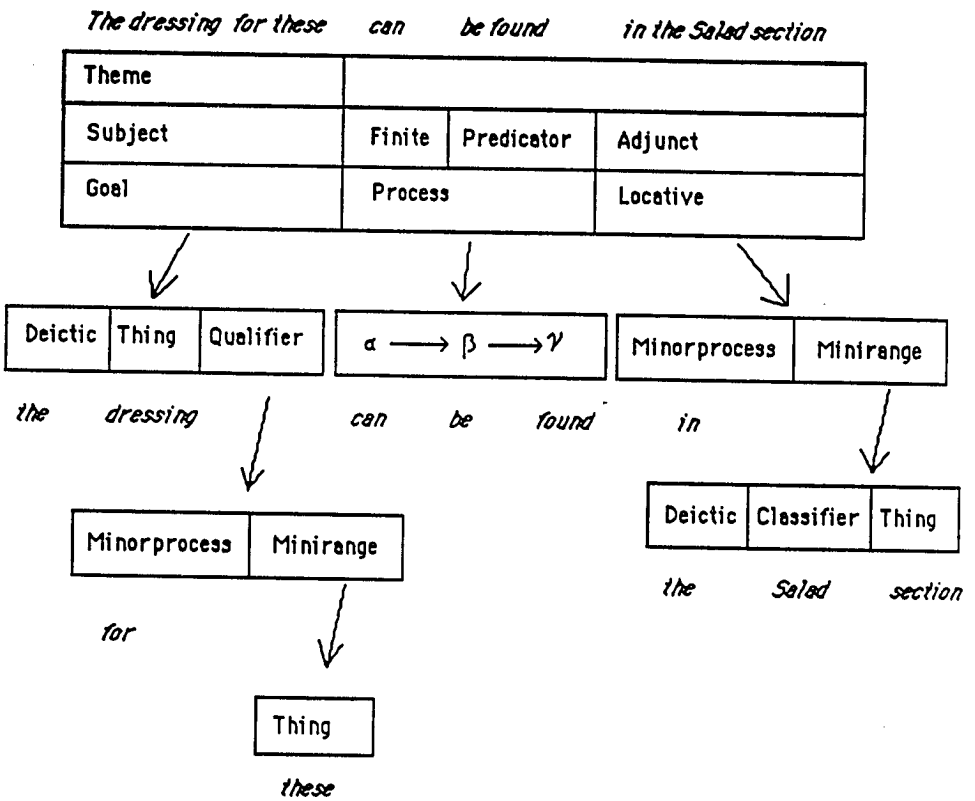


Fig. II:1.2-56: Independent domains of structure

The diagram also indicates the way in which the generation algorithm discussed in Section II:1.2.1.6 would generate the example. Each unit box

represents a separate grammar entry and is generated by the subsequent traversal.

The fact that the domain of application is the grammatical unit and that it is thus defined by rank-boundaries is of fundamental significance in contrasting a systemic grammar with a transformational one. Since transformational grammar is based on immediate constituency and not on the principle of a rank-scale of units, attention has been focussed on finding constraints (conditions) on rules so that they do not range freely over syntagms (phrase markers) -- constraints such as those proposed by Ross (1967) and the more generalized ones that have been proposed since the pioneering work in the 1960s. In a sense, the systemic situation is the reversal of the transformational one: in the unmarked case, a unit of a particular rank is the domain of function structure specifications, but there are certain cases (to be discussed below) where it is necessary to 'look beyond' the domain of the grammatical unit. It is thus perfectly natural that, say, the Theme of a clause cannot be a constituent from another unit such as a postmodifying clause in a nominal group realizing one of the constituents of the clause of the theme selection (cf. the complex noun phrase constraint), a clause realizing the Subject of a clause (cf. the sentential subject constraint), a projected wh-clause in a hypotactic clause complex (cf. the wh-island constraint), or part of a complex unit realizing a constituent in the clause of the theme selection (cf. the coordinate structure constraint). These 'constraints' require no special provisions but constitute the unmarked case.

(iii) Compact functions

Realization operators operate on functions as discrete object and without presupposing any internal organization of these functions; there is no overlap, fusion, or merger of functions. In particular, there is no realization operator Include for inclusion statements such as (Include Goal Process), i.e. include Goal within Process, or (Include β α).

The lack of reference to the internal organization of a function correlates with the domain constraint, since the internal organization is almost always the result of the realization of the function and another cycle through the grammar. Thus, the internal organization of a constituent function of a particular unit is usually not visible to operations within that unit.[6]

(iv) Complex operands

The realization operator Expand allows one function to be expanded by one or more other functions, as in (Expand Mood Subject Finite), and Preselect allows one function to be preselected for more than one feature, as in (Preselect Subject nominative noninteractant) but except for these two operators, the realization operators do not allow complex operands. For example, only Process / Predicator is a possible realization statement, Process / (Predicator & Adjunct) is not. In this respect, statements in the Nigel grammar differ from

[6] I say "usually" because internal constituency may be created by the Expand operator. I will discuss a particular way of using Expand to allow access to the constituents of a prepositional phrase within clause structure in Section II:3.2.6.2.2.

comparable statements in Kay's Functional Unification Grammar, such as

$$\begin{bmatrix} \text{Process} = & \begin{bmatrix} \text{Predicator} \\ \text{Adjunct} \end{bmatrix} \end{bmatrix}$$

Fig. II:1.2-57: Unification with complex description in FUG

I will look at the consequences of these four general constraints in some more detail in the context of each realization operator and will also add a few more specific constraints for individual operators. Sometimes the constraints may be too strict, preventing the grammar from producing what is needed. That is why I have called this version of the grammar the baseline grammar; extensions will be discussed in Section II:3.

1.2.2.4 Structuring

Structuring is the dimension that defines syntagmatic organization within one rank and within one (metafunctional) layer of structure. Grammatical regions make structural contributions such as transitivity structure (e.g. Agent Process Medium), mood structure (e.g. Subject Finite), theme structure (e.g. Theme Rheme), tense structure, and modification structure.

The realization operators used to specify structuring are **Insert, Order,** and **Expand.** Their use will be illustrated with examples from the MOOD region of English grammar.

1.2.2.4.1 Insert

1.2.2.4.1.1 Characterization

The **Insert** operator is used with a grammatical function such as Subject, Agent, and Theme as its operand, e.g. (Insert Subject) or +Subject for short. It specifies the presence of the function in the function structure being generated as a constituent. For example, in the specification of a clause, we may associate the realization statement +Subject with the grammatical feature 'indicative' as in the grammar fragment above. This means that the function Subject is present in the structure of a clause *as a constituent of the clause structure.*

1.2.2.4.1.2 Result

The result of the application of +Subject is simply a constituent branch and node in a tree diagram or a constituent box in a box diagram:

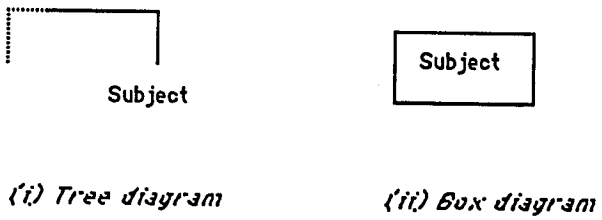


Fig. II:1.2-58: + Subject -- structural result in diagram

1.2.2.4.1.3 Constraints

Two important constraints on the Insert opertor will be mentioned, one having to do with the status of an inserted function and one with its constituency; both of them are applications of the general constraints on actuality and domain identified at the beginning of Section 1.2.2.3.2:

(i) Actuality: insertion means actual insertion, not potential insertion.

(ii) Domain: a function is inserted into the structure of the current unit.

(i) When an inserted function is declared to be present, "present" means '*actually* present' and not 'potentially present' or 'present in the default case'. Once inserted, a function is and stays actually inserted. As with all realization statements, the context of insertion is defined paradigmatically by a feature or complex of features in the system network. The general principle is as follows:

An insertion statement is not specified in the system network until the point at which it can be interpreted as actual insertion.

To take a simple example I have already used, rather than saying that clauses in general have a Subject, we can specify the context for inserting Subject as indicative, as a first approximation, thus contrasting with imperative:

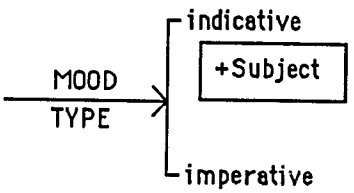


Fig. II:1.2-59: Paradigmatically defined context for insertion

(ii) *Domain:* The fact that Subject is a constituent of clause structure means that it is available to other structure specifications within the clause but not outside the clause. It also means that it is not a constituent of any other unit, e.g. a rankshifted (embedded) constituent clause. Furthermore, a clause cannot insert a function into e.g. a verbal group or a nominal group.

1.2.2.4.1.4 Problems

I will discuss a potential problem with the first constraint, the constraint that insertion means actual insertion, in Section II:3.1.5 below.

1.2.2.4.2 Order

Order has also been called concatenate, e.g. in Halliday (1969). (The operator for inclusion, indicated by diamond brackets < >, used since Halliday (1956), is not defined in Nigel; it will be discussed later.)

1.2.2.4.2.1 Characterization

The operator **Order** is applied to two functions, e.g. (Order Subject Finite) or Subject fl Finite. (It was represented by + in Halliday (1970), e.g., Theme + Rheme.) It introduces a precedence relation between the two functions in realization sequence. There are two varieties of this operator, one that only specifies the precedence relation and one that also specifies contiguity so that no other constituent can intervene. I shall not distinguish them here. (I shall also omit OrderAtEnd and OrderAtFront; see further Mann & Matthiessen (1984) and Matthiessen (1985). They can be interpreted as Order in relation to a boundary symbold, in any case; e.g. (OrderAtFront Theme) can be represented as (Order # Theme), where # ... is the left boundary of the clause.) The Order operator specifies a circumstantial (enhancing) relation, e.g. Subject precedes Finite.

1.2.2.4.2.2 Result

The result of the application of Finite fl Subject is represented diagrammatically as follows:

Finite	Subject

Fig. II:1.2-60: Finite ^ Subject -- structural result in diagram

In a box diagram, we can usually not tell whether the sequence is significant, i.e. introduced by a sequencing statement like (Order Finite Subject), or not.

1.2.2.4.2.3 Constraints

I will mention three constraints on the Order operator, two of which are the familiar ones concerning actuality and domain:

(i) The operator Order specifies *actual* sequence and not potential sequence; it does not specify a default sequence that could be over-ridden.

(ii) *Domain:* Only constituents of the unit whose structure is being specified can be ordered in relation to one another. For example, the clause constituent Subject can be ordered with respect to the clause constituent Finite but not with respect to a Qualifier from a nominal group structure.

(iii) *Inheritance:* Furthermore, once a functional constituent such as Subject has been ordered all the constituents of the unit realizing that function

(Subject) have to obey the ordering specification.

(i) The first constraint says that the Order operator always specifies the actual sequence. There is a mechanism for ordering other than the Order operator: ***default ordering*** lists. They list functions in the sequence they will appear in unless another ordering has been specified explicitly by means of the Order operator. They are not used as conditioned realization statements associated with particular systemic features. In contrast to the first constraint, the lists specify potential (default) sequence. A default ordering list in Nigel is comparable to Fawcett's (1973; 1980) starting structure as an ordering statement.

(ii, iii) The next two constraints are appropriate most of the time and reflect an important principle concerning ordering and functional domain. As we have seen (cf. Section 2.3 above), the grammar is rank-based and the structure of a particular unit applies to the rank of that unit only. Other units are related by realization to the functions of the structure of this unit. Consequently, the grammar can only see the structure of the current unit at any given time.

For example, when Subject is ordered before Finite in the clause cycle through the grammar in an example such as the following --

(Subject:) `Asparagus, seakale and globe artichokes` (Finite:) `are often served hot at the beginning of a meal.`

-- the grammar can only refer to Subject as an element of clause structure; it cannot refer to the elements of the complex nominal group to be developed in the later nominal group cycle through the grammar as the realization of Subject. The elements of the nominal group belong to another unit and have not been developed as yet in any case (since the generation algorithm does not re-enter the grammar to develop the nominal group until after the clause has been completely specified; cf. Section II:1.2.1.6 above):

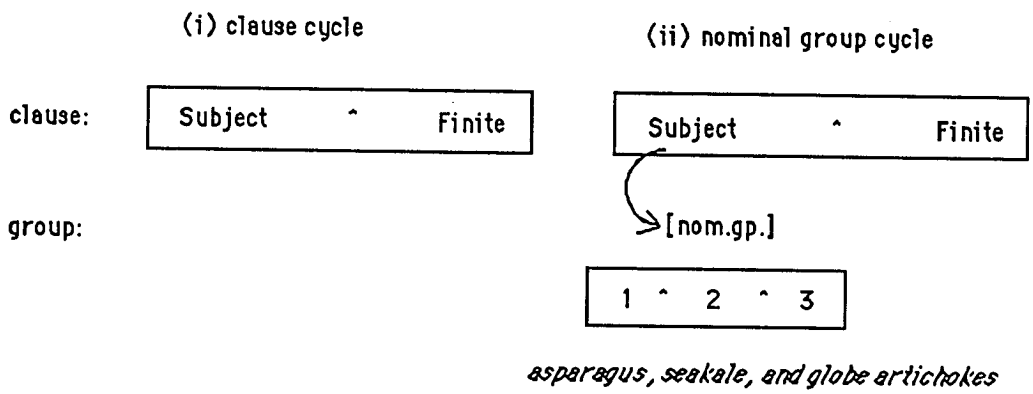


Fig. II:1.2-61: Subject and structure of nominal group realizing it

Although there is no interrank ordering, there is no constraint that disallows *inter-layer ordering* within the structure of one unit, that is, ordering statements involving functions from different layers of structure. For example, there is no formal problem with an ordering statement like Subject ^ Medium with one mood function and one transitivity function. However, there has not been any reason to use ordering statements of this kind so far in Nigel's grammar of English. There is, in fact, an important functional principle here: functions tend to

be ordered in relation to other functions from the same metafunction. For example:

	Interpersonal	Experiential	Textual
Interpersonal	Subject ^ Finite Finite ^ Subject Finite ^ Polarity Finite ^ Modality Modality ^ Finite Tagfinite ^ Tagsubject		
Experiential		Process ^ Manner Direction ^ Place Manner ^ Place ^ Time Medium ^ Benef. Benef. ^ Medium	
Textual			Theme ^ Rheme Theme ^ Conjunctive Textual ^ Interpersonal ^ Topical

Let's look at two examples in more detail, (i) ordering of adjuncts according to metafunctional type; and (ii) ordering of Medium and Beneficiary.

(i) Adjuncts are interpersonal, experiential, or textual. Focussing on the first two types, we can note the following principle:

> interpersonal adjuncts of the modal subtype belong to the Mood of the clause and are ordered in relation to the interpersonal function Finite when they are non-thematic and non-culminative; experiential adjuncts cannot be part of the Mood and are ordered after the experiential function Process and in relation to one another.

Interpersonal adjuncts include modal adjuncts that belong to the Mood part of the clause and relate in meaning to its Finite element and, as Halliday (1985: 82) observes, they tend to occur immediately before or after Finite unless they are thematic; e.g.,

Modal ^ Finite:

He <u>probably</u> <u>won't</u> leave until sometime after noon

He <u>certainly</u> <u>has</u> <u>to</u> do that in any case

the Review <u>presumably</u> <u>can</u> replace him (LA Times)

Finite ^ Modal:

He <u>will</u> <u>probably</u> leave sometime after noon

He <u>has</u> <u>certainly</u> done that already

In contrast, experiential adjuncts, such as Manner (including means as well as degree and quality), Place, Direction, Time, Duration, and Matter, appear after the Process when they are non-thematic, or, in the case of Manner (degree or quality), sometimes immediately before the nuclear part of the Process. Thus,

an expression of manner contrasts with an expression of modality:

> These questions (Modal:) presumably (Finite:) won't be (Manner:) quickly (Process: event-part) dealt with at all

> For the investigator of turn-taking systems per se, it is not surprising that there are various ways that turn-taking systems can be workably built. (Sacks et al., Simplest Systematics for Turn-Taking)

Moreover, default sequences can be stated for at least some of them in relation to one another. For example, Quirk et al. (1972: 8.77) note the normal order for [non-thematic] process (our Manner), place, and time adjuncts is

Manner ^ Place ^ Time:

He was working with his shears in the garden the whole morning.

(ii) When neither Medium nor Beneficiary is Subject or marked Theme, these two experiential transitivity functions are ordered in relation to one another, either as Medium ^ Beneficiary or as Beneficiary ^ Medium:

Medium ^ Beneficiary:

He sold his old car to his neighbour

Beneficiary ^ Medium:

He sold <u>him</u> <u>his</u> <u>old</u> <u>car</u>

1.2.2.4.2.4 Problems

The constraints on domain and inheritance reflect the unmarked case. However, there are certain cases where constraints 2 and 3 are too strict, viz. examples involving theme and information prominence; for example: *There was <u>this strange and noble figure</u> in Peru during these years, <u>the Captain Alvarado</u>, <u>the traveller</u>*. These situations will be further exemplified and discussed below (Section II:3.2.6).

1.2.2.4.3 Expand

1.2.2.4.3.1 Characterization

The operator Expand is applied to one function to be expanded and one or more expanding functions, e.g. (Expand Mood Subject) or Mood (Subject), Mood (Subject, Finite), and so on. It creates a constituency relation between the expanded function and the expanding function(s). Thus, Mood (Subject) means that Subject is one of the constituents of the Mood constituents. It is used when a function is not an immediate constituent of a unit (which it is by default, when the Insert operator is applied to it, as in +Subject, which inserts Subject as a clause constituent) but when in it is a constituent of a function that is an immediate constituent in the structure of the unit. (In principle, indefinitely long constituency chains could be created, but in practice, there has never been any need for a situation more complex than the one illustrated by Mood (Subject), where Mood is an immediate constituent of the clause and Subject is a constituent of the Mood constituent.) The Expand operator specifies a possessive relation of the part-whole kind, e.g. Subject is part of Mood.

1.2.2.4.3.2 Result

The structural result of the application of Expand is illustrated diagrammatically below:

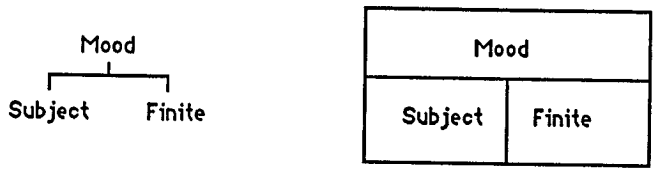


Fig. II:1.2-62: Mood (Subject, Finite) -- structural result in diagram

1.2.2.4.3.3 Constraints

The first two constraints are the familiar ones concerning actuality and domain; the third anticipates another realization operator, Preselect, but I will state it here:

(i) Expansion is *actual* expansion, not potential expansion.

(ii) *Domain:* Only functions from the same unit can be related by Expand.

(iii) *Realization:* A function expanded by another function cannot be preselected for a feature. Only functions that are immediately realized by a grammatical class can be preselected. There is no mechanism for spreading or distributing preselected features from an expanded function to its expanding functions.

(iv) *Complexity:* A function can be expanded by more than one function, but a function can expand only one other function; there is no double motherhood.

One example of the consequences of the third constraint will be mentioned below in Section II:3.2.5.2. Expand is not used very much. In Nigel, its main uses are in mood structure reflecting prosodic organization (see Section II:3.2.5.2) and in theme structure reflecting thematic prominence (see Section II:3.2.6.2.2). In the second case, it crosses metafunctional layering, as in Theme (Locative), which is used to specify that Locative is locative and thus is part of the Theme of the clause.

1.2.2.4.3.4 Problems

When Expand is used to simulate prosodic organization, it might be useful for the expanded function to be allowed to carry preselections; see Section II:3.2.5.2.

1.2.2.5 Metafunctional layering

Metafunctional layering is the dimension (structural 'breadth') that defines the organization across layers of function structuring such as transitivity structure, mood structure, and theme structure; it represents the reconciliation of these

various metafunctional contributions.

1.2.2.5.1 Characterization

The realization operator used to specify metafunctional layering is **Conflate.** It is applied to two grammatical functions, e.g. (Conflate Subject Agent) or Subject/Agent (sometimes the equal sign has been used, Subject = Agent; e.g. Hudson (1971); or a colon, Phenomenon : Agent, as in Halliday (1970)). It means that they describe the same constituent. Conflate specifies an identifying relation: Subject is Agent; Agent is Subject.

1.2.2.5.2 Result

The structural result of conflation is represented by a column in a box diagram:

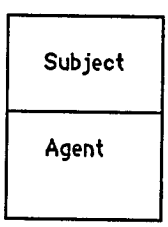


Fig. II:1.2-63: Subject / Agent -- structural result in box diagram

There is no commonly used tree diagram representation of layering, although there is a tree-like diagram in Relational Grammar where the so-called strata

are comparable to metafunctional layers:

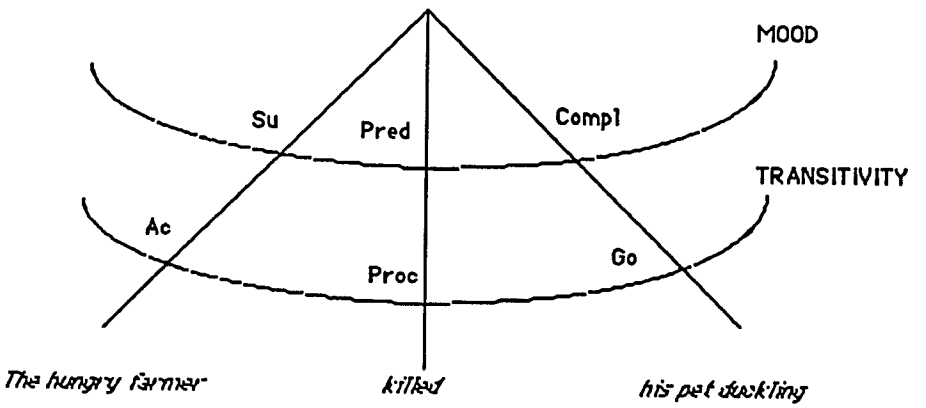


Fig. II:1.2-64: Relational Grammar diagram of layers

However, as the following tree diagram of a more complex example illustrates, the mappings are not always one-to-one.

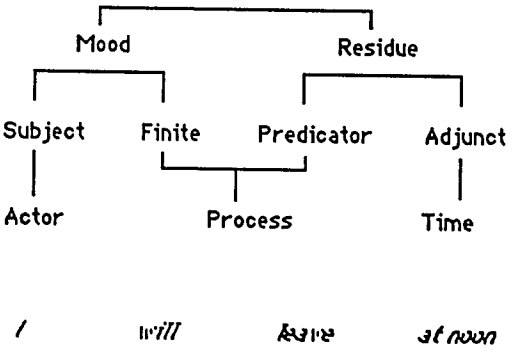


Fig. II:1.2-65: Expansion and conflation in clause

1.2.2.5.3 Constraints

I will mention three constraints.

(i) Conflation is *actual* conflation, not potential conflation: Both functions in a conflation statement have to be inserted at some point during the same pass through the grammar as the conflation. If one or both functions do not get inserted, there is an error in the grammar.

(ii) *Domain:* Only functions from the structural specifications of the same unit can be conflated; there is no inter-rank conflation. For example, Subject (from the mood structure of the clause) and Agent (from the transitivity structure of the clause) can be conflated but Subject and Minirange from a prepositional phrase structure cannot.

(iii) *Complexity:* The result of the application of conflation is a function bundle (or fundle). The functions conflated in a function bundle always describe the same constituent. It is not possible to apply Conflate to functions and maintain different constituents for the different functions.

As with the Order operator, the constraint on the domain of application reflects an important principle: units are developed one at a time and the functional subcomponents of a particular unit, such as THEMATIZATION and WH-SELECTION, make reference to the structure of that unit only. For example, the candidates that can be selected to be conflated with Theme or Wh in the clause

have to be elements of clause structure; elements of the structures of other units are not visible at the time of the selection. Thus, Wh cannot be conflated with part of a nominal group complex to be generated, which prevents the grammar from producing examples such as

(Wh:) `Who did you meet` (Complement:) `[__ and Mary]?`

since only the Complement is accessible as a 'conflatee' of Wh. There is, of course, no problem with the following example where *who* is Complement and *with Mary* is another constituent of the clause, an Adjunct of accompaniment:

(Wh/Complement:) `Who did you meet` (Adjunct:) `with Mary?`

If a function is conflated with another, any preselected features apply to the constituent as a whole. For example, Wh is preselected for wh- , which applies to the unit realizing Wh whether it is simple or complex. Thus, the grammar cannot produce examples such as the following where only one element of a complex nominal group instantiates the preselection:

(Wh: wh/Complement) `Who and Mary did you meet?`

But, again, of course, different constituents can carry different preselections:

(Wh: wh/Complement) `Who did you meet` (Adjunct:) `with Mary?`

1.2.2.5.4 Problems

There are cases where Subject, Theme or Wh conflate with functions that appear to be outside clause structure and which are thus not accessible for conflation: see Section II:3.2.6.

1.2.2.6. Rank

The third dimension of organization to be discussed is rank. Structuring and layering together make up the function structure of one unit such as the clause. Rank organizes the grammar into a scale of units: clause - group/phrase - word - morpheme.

1.2.2.6.1 Characterization

The realization operator that handles communication between ranks is **Preselect.** The Preselect operator is applied to a function and a feature; it relates function structure to syntagm (cf. Section II:1.2.2.2 above). For example, Subject may be preselected to be singular: (Preselect Subject singular) or Subject: singular. This means that the feature singular will be chosen (in the NUMBER system) when the grammar is re-entered to realize the Subject function bundle.

1.2.2.6.2 Result

The result of the application of the operator Preselect is represented simply by listing the preselected features under the function they have been associated with. For example, Subject: singular is recorded in the following way:

Subject [singular]

Fig. II:1.2-66: Subject: singular -- structural result in box diagram

1.2.2.6.3 Constraints

I will mention two familiar constraints.

(i) *Actuality:* preselection means actual preselection.

(ii) *Domain:* preselection operates down the rank scale.

(i) Preselection is *actual* preselection. Once a feature has been associated with a function through preselection it has to be chosen when the function is realized and the system network is traversed. For example, if we preselect Subject to be nominative, Subject: nominative, Subject has to be realized by a nominal group with that feature. When a preselection such as Subject:

nominative is encountered in generation, the path that leads to that feature in the system network is computed through path augmentation or back chaining to ensure that the feature will actually be selected.

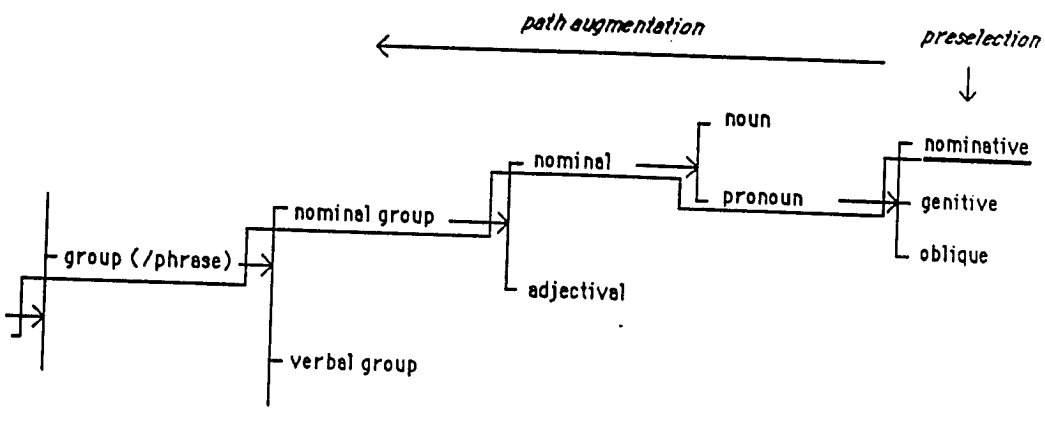


Fig. II:1.2-67: Path augmentation

(ii) *Domain:* In principle, the operator works *down the rank* scale, from clause to group/phrase, from group/phrase to word, and from word to morpheme. There may also be rankshift, e.g. preselection from clause to clause as group/phrase or from group to clause as word. Preselection cannot be stated within the same rank (unless there is rankshift). For example, it is not possible to use Preselect to state a preselection relation between a nominal group and a verbal group when both realize clause functions such as Subject and Finite/Predicator. The constraint can also be phrased in terms of constituency.

Preselection works downwards in constituency from a whole to one of its parts; it does not work across from one part to another. Control of selection exercised by Preselect is top-down control.

For example, if we want to use Preselect to ensure agreement between Subject and Finite, we have to set up clause systems for SUBJECT PERSON (or perhaps more accurately MOOD PERSON, cf. Section II:3.2.5.2 below). If the grammar contains a system for INTERACTANT SUBJECT where one of the features is addressee subject, we can associate the realization statements Subject: second person and Finite: second person with it to take care of agreement as in *you are.*

1.2.2.6.4 Problems

The first constraint can be a bit awkward, since it would sometimes be useful to be able to state that a feature is to be selected if its system is entered without forcing the system to be entered. For example, it would be useful to be able to state Subject: nominative for all Subjects although the feature nominative will only actually be chosen if the Subject is pronominal.

The strategy for ensuring agreement mentioned in connection with the second constraint works up to a point, but there are problems, to be discussed below.

[... With the help of the three types of relation -- elaboration, extension, and enhancement, we can identify the parallels between paradigmatic and syntagmatic organization:

	system network	structure
extension	conjunction, disjunction	constituency (part-whole)
elaboration	delicacy (ascription)	layering, (identifying) preselection (ascription)
enhancement	?	structuring

Fig. II-: Relation types in paradigmatic and syntagmatic organization

...]

2. Coverage

2.1 Introduction

The research to date on text generation has yielded very little knowledge about what a grammar of a text-generation system ought to cover to be highly useful, both in particular text-generation systems and as a product that is portable from one system to another. We have to accumulate a new body of knowledge about the demands we should put on a text-production grammar in the hope of making it a good one. This section is an attempt to take a step in this direction.

The central notion will, as already mentioned, be coverage. By this I am referring to the contents of a grammar; what is in its scope. I could say "the constructions in the scope of the grammar, i.e. that the grammar can generate" and this may serve as a first approximation. However, the scope of the grammar is better characterized in functional rather than structural terms: what is significant is what functional resources the grammar provides the text generator with. It is this notion of coverage that will be used in the section. To begin with, I will say a few words about coverage in linguistics and then turn to coverage in text generation.

(i) Approaches to coverage in linguistics

In working on grammar, we can approach the descriptive task either in terms of a view of the whole of the grammar or in terms of fragments identified as being of particular interest. In the first case, there is unified coverage to start with, but it must be extended by providing more delicate specifications. In the second case, unified coverage has to be achieved by integrating and reconciling fragments:

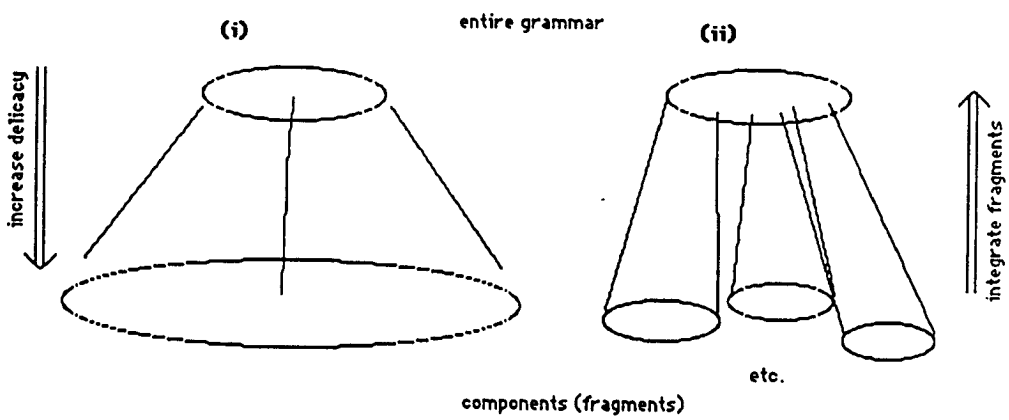


Fig. II:2-1: (i) systemic approach and (ii) formal approach to coverage

Modern theoretical linguistics has tended to favour a strategy of development where a small area of grammar, e.g., Equi NP deletions, imperative formation, raising, gapping, reflexivization, and unbounded dependencies, has been treated in relative isolation from a breadth point of view but pursued to a great

depth.[1] Essentially this strategy of isolating a small area of grammar has led to the creation of detailed mini-grammars (grammar fragments) that address particular problems, usually selected on the basis of their challenge to the theory or their elegant treatment within it. If one's goal is eventually to build a grammar with a breadth of more than fragmentary comprehensiveness, this strategy is not entirely unproblematic.

There have been few attempts to develop formal grammars that integrate grammar fragments to achieve general coverage. The well-known 'UCLA' grammar, cast in the transformational framework, may be the only example for English. Stockwell et al. describe their effort with this grammar:

This work was originally undertaken under the title "Integration of Transformational Theories of English Syntax" in the naive expectation that most of the information about the transformational analysis of the grammar of English that was available up through the summer of 1968 could be brought together and integrated in a single format.

Now, quite a bit later than we intended, and considerably less integrated than we had hoped ...

This quotation indicates one difficulty with the mini-grammar approach, specifically, that of keeping to a uniform notation or format. In fact, in the development of mini-grammars the goal has often been to experiment with and

[1] These small areas of grammar often correspond to one part of one of the functional subdomains identified in Figure II:2-7 below in Section II:2.2.1, but they have not been studied in the light of functional considerations.

change the notation. This is the 'prestige activity'. Comprehensive descriptions do not seem to have had the same status recently. In his foreword to a book with extensive descriptive coverage of nominal compounds (Levi, 1978), James McCawley observes that "professional linguists both do linguistics and talk about linguistics" and writes that it is "[a] regrettable fact that recent linguistics reflects the latter activity so much more than the former." He goes on:

> Existing textbooks in transformational grammar provide students with extensive training in the grinding of axes but little training in the use of already ground axes in the felling of trees.

In contrast, functional linguists in general, including systemic-functional ones, tend to talk much more about language than about their axes and other tools.

There are very few formal generative grammars of significant coverage. In a critical appraisal, Gross (1979) comments:[2]

> ...one may wonder why no linguist has been able to construct a transformational grammar with the type of coverage that traditional grammars used to provide....The only recent attempt in this direction Stockwell et al. is not a grammar; it is an attempt to integrate partial data of heterogeneous origins, and a study in consistency of rules. It is the only compilation of transformational constraints ever attempted, and is now obsolete--mainly because new theoretical developments, have, it seems, entirely modified the situation.

Comprehensive treatments are usually cast in terms of traditional or modified traditional grammar -- particularly Jespersen (1909-49), Kruisinga, Poutsma,

[2] Gross's article is called "On the failure of generative grammar." I would argue that his title is too general and that it improperly identifies generativity with the failure phenomenon. His arguments apply to the Chomskyan tradition but do not address work carried out in, for example, systemic grammar.

and Curme -- the monumental grammars of English of the first half of this century, continuing and refining the earlier tradition of work on English grammar -- and Quirk et al. (1972, 1985).

Even within the kind of functional linguistics that has emerged during the 1970s and 1980s, the emphasis has not been so much on the exhaustive coverage of English grammar, or, with important exceptions such as Li & Thompson (1980), of grammars of other languages as integrated systems, as on cross-linguistic, typologically-oriented studies.

One exception to the tendency in modern theoretical linguistics towards mini-grammars is the systemic tradition where effort has gone into charting English grammar in its entirety. The strategy is to start with a grid intended to cover the whole of the recognized area, as a first approximation, and then move on to gradually filling out the grid -- approach (i) in Figure II:2-1 above, rather than starting with unconnected islands charted in great detail. This can be seen in the research on scientific English directed by Halliday in the 1960s and reported on in Huddleston et el. (1968).[3] In a number of articles, Halliday and others have various functional domains of English grammar, domains such as transitivity, mood, modality, theme, and information. Halliday (1985) gives a "thumb-nail" sketch of a systemic-functional interpretation of English, which can serve as a guide in work on text generation. In his review of it, Hudson (1986) comments on the scope of the coverage:

> The coverage is unusual -- [Halliday] tends to continue his analyses at the points where other linguists give up in

[3] Being text-based work, it couldn't find a publisher in the linguistic climate of that period.

> despair, such as intonation, topicalization, adverbials, and the fuzzy area where sentence structure fades into discourse structure. ... [An Introduction to Functional Grammar] is a challenging book -- it challenges those of us who are outsiders to see if we can produce anything as impressive in its scope and internal consistency. ... I know of only two other attempts to present a unified, theoretically based account, namely the 'UCLA' grammar of Stockwell et al. (1973) and Huddleston (1984), a work which owes a lot to Halliday's influence.

(ii) Coverage and text generation

Text generation raises special questions regarding the scope of coverage of a grammar. If our descriptive task is to produce a *parsing grammar* for (say) a machine translation system, there is a reasonably clear test of lexicogrammatical coverage: we can check the grammar against a corpus of test texts and this is one way used to identify what coverage is needed in the development machine translations systems. We might call this approach a corpus-based induction of the system from the text, using system and text in Hjelmslev's (1943) sense. At the same time, it is clear that this approach presupposes a reasonably specific text type or set of text types, such as weather reports, technical memos, or washing machine manuals.

In a similar way, the task of specifying the coverage for a grammar intended to work in a stock market report generator or a recipe generator is not too hard. The test is not as straightforward as with a parsing grammar for a machine translation system, since we cannot simply feed texts to the grammar to see if it can cope. Rather, we have to judge the naturalness of its output: does it

produce natural culinary clauses; and so on?

At one extreme, then, we have the task of writing the lexicogrammar of a fairly restricted register such as weather forecasts or stock market reports. Many text generation grammars have tended towards this extreme. They have been integral parts of programs designed to generate a particular kind of text. From a practical point of view, there is an obvious drawback with this approach. Every time we come to a new generation task, we have to write a new task specific grammar.

There is also a theoretical concern in AI that affects our decision on the task-specificity of the grammar. It has been argued that successes in AI in the early 1970s were due, to a large extent, to the reliance on 'micro-worlds' such as the blocks world in Winograd's (1972) SHRDLU system, but that these micro-systems do not add up to anything larger or more general (cf. Dreyfuss, 1981). The categories of the grammar are general across the micro-worlds of various registers, which is one aspect of the applicability of language to a multitude of different tasks. The assumption about the generality of grammar is embodied in linguistics. While limiting cases such as the grammar of "headlinese" are recognized, grammar is not analysed as a set of register-specific grammars. Rather, different registers draw in different ways on the same grammar. Indeed, grammar has been contrasted with semantics in exactly this respect: grammar is general across registers, but it may be useful to set up register-specific functional semantices (Halliday, 1973; 1978). I will return to the notion of register-specific semantices and the question of different uses of the same grammar and different semantices below (Section III:6). To deal with questions of coverage, we need to know more about the ways in which registers draw on

grammatical resources and I will discuss this question presently.

Now, the decision to produce a general generation grammar will put us on the right track, but, at the same time, we are back where we started: what should the grammatical coverage be? In theory, we could move to the other extreme and decide to incorporate all of e.g. Quirk et al.'s reference grammar, since it is based on a very varied corpus. This approach is obviously not feasible either at this stage -- it would be a major research effort just to make the descriptions in the reference grammar detailed and explicit enough to be put into the computer.

What we need at the present stage of development is to use a two-pronged approach:

(i) We have to take the notion of general grammar as a starting point, draw the grammatical blueprints, and push the production of it as far as possible, guided by some notion of 'core' grammar and general considerations of what is required of a text generation grammar.

(ii) At the same time, we must produce register-specific instances of the general grammar and explore how they are related to the general grammar.

As long as the ways in which a specific instance of the grammar is related to the general one are motivated by register theory and the grammar is designed as an independent resource in the text generation system, we have not lost the option of moving from one generation task to another without having to redesign the whole system. While the register-specific instances of the general grammar

conceived in this way are, in some sense, 'mini-grammars', particularly if the register is one of the fairly restricted types attempted in work on text generation, they are functionally motivated mini-grammars: their restricted scopes are determined by the contexts in which they are used, not by the linguist's agenda. The two parts of the approach are diagrammed below.

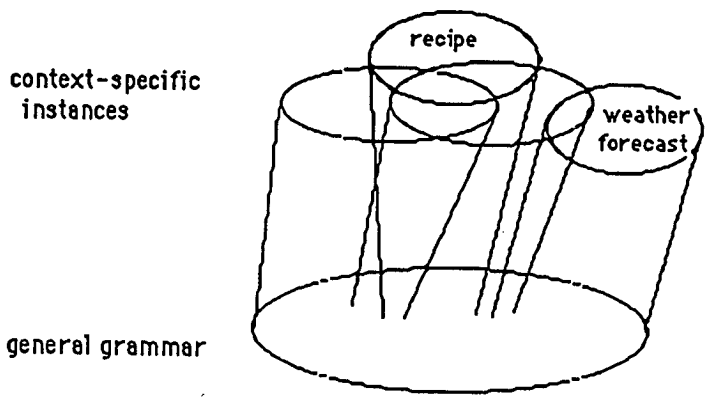


Fig. II:2-2: Coverage, general & specific

In the remainder of this section, I will follow these recommendations. I will start with a characterization of the general grammar, using Halliday's (1970) systemico-functional map of the grammar of English.

2.2 Lexicogrammatical cartography

A full system network specifies the grammatical potential, i.e., what the speaker can do with the grammar. So coverage of grammatical options is

coverage of what the speaker can do grammatically (and *not* the means by which it is done, which would be coverage of grammatical structure). One advantage of stating a grammar as a network systems is that this gives us a fairly straightforward way of talking about the extent of the coverage of a grammar.

Martin Kay has suggested (panel discussion, TINLAP 3, 1987) that one of the attractive properties of unification grammars is that they allow us to work with grammars in terms of the 'chapters' of traditional grammar: they give us that kind of topical modularity. This is a fundamental point: the kind of modularity we are interested in here is not one suggested by the formalism of the metalanguage -- it is not one of rule type, such as base components (PS-rules) vs. transformational component (T-rules) in 'standard' transformational grammar. Rather, it is one suggested by the language itself. But we can do better than the chapters of traditional grammar; we can operate in terms of functional components and subcomponents.[4] To do this, we can talk about the 'dimensions' of the system network by means of the scales discussed in Section II:1.2.1.2 -- metafunction, rank, and delicacy.

2.2.1 Longitude, latitude, and scale : metafunction, rank, and delicacy

Metafunction determines the functional scope of a given unit -- ideational,

[4] These functional components have long been part of the systemic interpretation of grammar; similar ideas are put forward in Givón (1984).

interpersonal, and textual. Rank is the ordering of units based on constituency in a functional grammar -- clause, group/phrase, word, and morpheme. By analogy, metafunction and rank are the longitude and latitude of the map of the grammar; they serve to locate the grammatical resources. And delicacy is the detail or granularity of the the account -- the 'scale' of the map, corresponding to the left-to-right movement in the system network.

Metafunctional breadth, delicacy, and rank are diagrammed below to suggest how the grammar as a system network of options can be mapped along these dimensions.

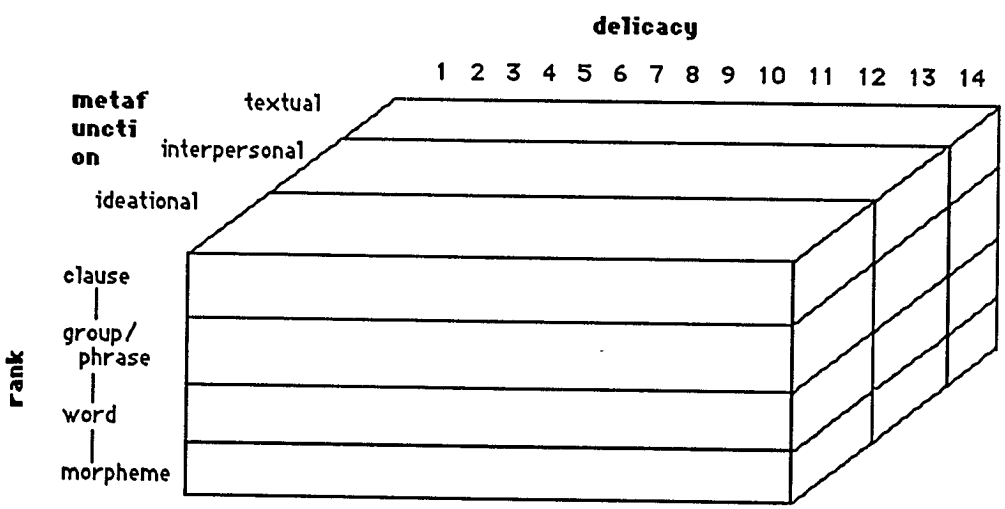


Fig. II:2-3: The dimensions of the lexicogrammar

This gives us the kind of abstract map of lexicogrammar we need as a starting point in an exploration of coverage. For instance, the resources of transitivity can be located at the intersection of ideational and clause and can be displayed

at any degree of delicacy.

Metafunction is the guiding principle of organization; it is the concept needed to reflect the highly generalized functional differentiation we find in grammar. I introduced the three metafunctions of systemic theory in Section I:1.2:

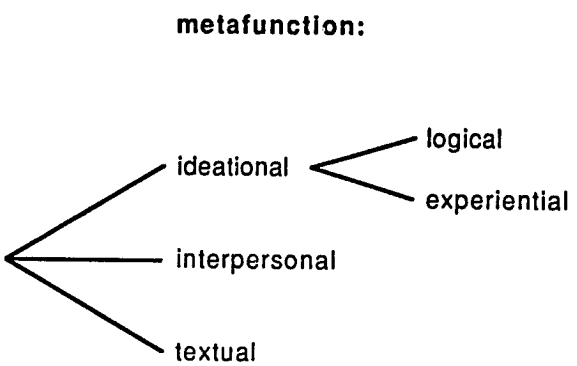
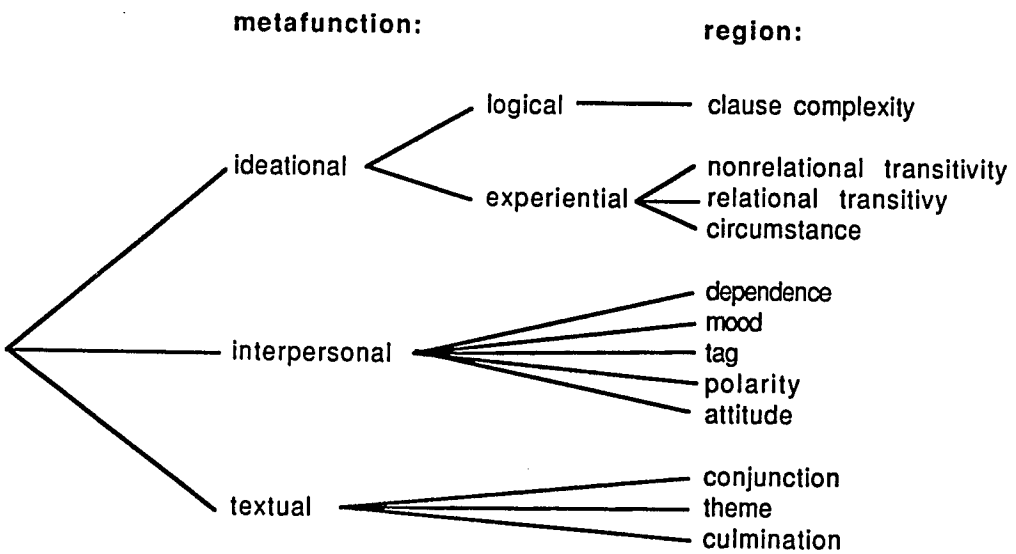


Fig. II:2-4: The metafunctions

The *ideational* metafunction is the resource for representing phenomena -- sequences of configurations, configurations of processes, participants, and circumstances, objects, qualities, quantities, and so on. The *interpersonal* metafunction is the resource for interaction between speaker and listener, i.e. for establishing and maintaining the communicative relationship between them. The *textual* metafunction is the one that enables the speaker to represent and interact by means of creating text: it is the resource for creating text in context.

Each metafunction defines a **functional component** or domain in the grammar -- the ideational component, the interpersonal component, and the textual component. For any given grammatical unit (clause, nominal group, etc.), each functional component is in turn divided into a number of smaller functional **regions** (subcomponents or subdomains).[5] Each region is a unified functional resource such as transitivity, mood, and determination. The functional regions for the clause in the current Nigel grammar are shown below.

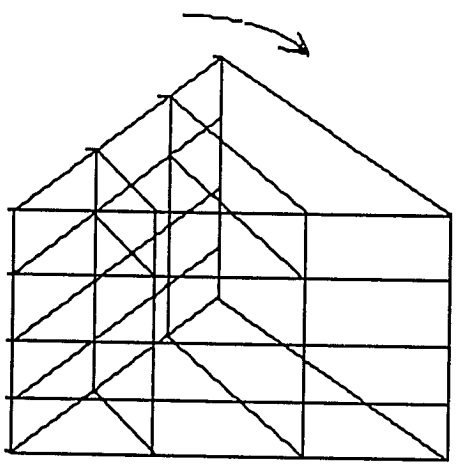


[5] It is of course not always immediately clear whether an area in the grammar constitutes a functional component by itself or whether it is a functional region that contributes to a functional component. In general, functional regions are easier to recognize than are the more general functional components. This is just an example of the extremely general observation that more specific subclasses are easier to find than are possible superclasses, in any classification. Fawcett (1980) sets up a larger number of metafunction than Halliday. The larger number is due to the fact that his typology sets up some of the functional regions as metafunctions. For example, negativity and affective are set up as separate functional components, but they are, in fact, part of the interpersonal component in Halliday's typology; cf. Section II:3.2.5. In general, Fawcett's larger number of metafunctions has, I think, come about because he has moved in at a higher degree of delicacy (cf. Matthiessen, 1984); for a similar suggestion, see Gregory (1987).

Fig. II:2-5: Clause regions

The particular set of regions within a metafunctional component depends on rank and class: they are located in the function-rank matrix. Each region has a grammatical unit, such as the clause, as it its ***point of origin.*** (As we will see presently, there are certain resources that recur throughout the grammatical system -- the logical resources for creating resources and the textual cohesive resources of reference and substitution/ellipsis in particular.)

We can derive the function-rank matrix from the three-dimensional map of Figure II:2-3. Leaving out delicacy, we can swing around the side of the box and get a two-dimensional metafunction and rank index to the grammatical resources:



TRANSITIVITY	MOOD	THEME
EPITHET CLASSIFIC.	PERSON ATTITUDE	DETERMIN.
...		

Fig. II:2-6: Two-dimensional map -- rank and metafunction

The following metafunction-rank matrix tabulates the regions of English; the coverage of the current Nigel grammar is presented in some detail in Matthiessen (1988).

rank: primary class:					ideational: logical	ideational: experiential	interpersonal	textual	(cohesion:)
clause					COMPLEXITY	TRANSITIVITY CIRCUMSTANCE	DEPENDENCE MOOD, TAG POLARITY ATTITUDE	THEME CULMINATION VOICE CONJUNCTION	REFERENCE, ELLIPSIS & SUBSTITUTION
group-phrase	phrase	prep.				MINOR TRANSITIVITY			
	group	nominal-like	nominal		CLASSIFIC.	NOMINAL TYPE EPITHET QUALIFICATION SELECTION	PERSON ATTITUDE	DETERMINATION	
			adj		MODIFIC.	QUALITY TYPE			
			quant		MODIFIC.	QUANTITY TYPE			
		adv.			MODIFIC.	circumstantial / CIRC. TYPE	comment / COMMENT TYPE	conjunctive CONJ. TYPE	
		verbal			TENSE		MODALITY PERSON		
					complexes	simplexes			
						information unit:	KEY	INFORMATION	

Fig. II:2-7: Functional regions in English

The metafunction-rank matrix given above presents a synoptic summary of the functional regions of the grammar of English. As the table indicates, certain

resources recur in the system: this applies to the logical metafunction, which serves to create complexes at all ranks; and also to the textual metafunction, whose cohesive resources of reference and substitution / ellipsis operate within several units. (The interpersonal resource of attitude also occurs within several units.)

Each region makes a contribution towards the functional component to which it is assigned, i.e., a contribution towards ideation, interpersonal interaction, or textualization, at the rank and within the class it operates. For example, the functional regions of MOOD, POLARITY, and TAG all work together to determine the interaction between speaker and listener. In the following example, MOOD (selection: yes/no in the system INTERROGATIVE TYPE) and POLARITY (selection: negative) combine to express the speech function of a question expecting an affirmative answer:

A: Isn't it Peel who's always having rows with Doyen: 'Is it Peel - I think it is Peel'

B: I don't know what he is doing now, but he always was very colourful.

Similarly, in the following example, MOOD (selection: declarative in INDICATIVE TYPE), POLARITY (positive), and TAG (selection: tagged) combine to express an assertion requesting a confirmation:

A: He brings in every argument from every field of activity under the sun. You've heard him on this, haven't you?

B: Yes, yes, yes, yes.

I will return to these interactions in Section II:3.2.

Relationship to IFG. Since I will rely on the interpretation of English presented in Halliday's (1985) Introduction to Functional Grammar (henceforth IFG) and it is the foundation of the Nigel grammar, I will relate it to the overview just given. IFG does not present an overview table, but the table I have presented follows that work quite closely. References to relevant chapters and sections are given below. (In Halliday's presentation, adjectival group and quantity group are subsumed under 'nominal group', so they do not appear as separate headings in the table below.)

			ideational			interpersonal	textual (cohesive:)
			logical		experiential		
clause Ch. 3,4,5; 7			Ch. 7: Above the clause		Ch. 5: Clause as representation (transitivity)	Ch. 4: Clause as exchange (mood, etc.)	Ch. 3: Clause as message (Theme) § 9.4 Conjunction
group- phrase Ch.6 7.A	phrase	prep. § 6.5	§ 7.A.1,3		§ 6.5: Prep. phrase		§ 9.2 Reference, § 9.3 Ellipsis & subst.
	group	verbal § 6.3	§ 7.A.4-6	§ 6.3.2 (tense)			
		nominal § 6.2	§ 7.A.1,2	§ 6.2.5 (modific.)	§ 6.2.1-3 (epithet, etc.)	§ 6.2.4 (attitude)	§ 6.2.4 (determ.)
		adverbial § 6.4.1	(§ 7.A.1,3)	§ 6.4.1 Adv. gp.			
			complexes Ch. 7, 7.A	simplexes			

Fig. II:2-8: Regions and references to IFG

The function-rank matrix presented above differs in some detailed points from earlier tables given by Halliday (e.g. , Halliday (1973: 133; 1978: 132). In particular:

POLARITY is treated as interpersonal here, but was classified as logical in Halliday (1973: 133; cf. also 1968: 202) and as experiential (clause) and interpersonal (verbal group) in Halliday (1978: 132).

MODULATION is treated as interpersonal here, but it is interpreted as ideational in Halliday (1970, 1973).

Similarly, as already noted, it differs from the proposal in Fawcett (1980) in that it groups functional components such as negativity (i.e., polarity) and affective together as interpersonal. These differences will be discussed below in Section II:3.2.5.

2.2.2 The ideational view: projection & expansion throughout the grammar

The function-rank matrix discussed above in Section II:2.2.1 focuses on the regions of simplexes while the logical resources for forming complexes are simply tabulated as applying to all ranks. There is a good reason for this, of course: we find the same relations of coordination, apposition, and so on holding between clauses as well as nominal groups, for example. Generalizing traditional relations such as coordination and apposition, Halliday (1985) has identified and systematized a small number of logico-semantic relations used to form complexes: projection[6] and expansion; and within expansion: elaboration, extension, and enhancement. These semantic types recur throughout the grammar of English. As can be expected, we find them in complexes; but we also find them in simplexes. (They are organized in different ways, though. In complexes, they form interdependency structures, paratactic or hypotactic; in the simple clause, they are represented by means of constituency.)

Most often they occur within the logical subtype of the ideational metafunction, but they also occur with the experiential one. Furthermore, they are manifested within the textual metafunction in conjunctive cohesive relations in text. The semantic types are thus interpreted by the grammar in functionally different ways.[7] (As we will see in Section II:3.3, the same might be said of modality,

[6] Quite different, of course, from the notion of projection in Government & Binding theory. Projection is a generalization of the traditional categories of quoting and reporting.

[7] It is, in fact, essential to dinstinguish between a semantic category such as projection, time, modality, or negation and a functional (sub)component, since the semantic type may be interpreted in functionally different ways.

but the 'dispersal' of modality through the functions of the grammar comes about through interpersonal grammatical metaphor.)

Halliday shows how the various types of expansion run through cohesive conjunction, clause complexes, and simplex structures of various kinds (summarized in table 9(3) in IFG). I will include projection as well in my survey of the grammar. I will start with the clause complex since it displays the greatest range of relations (apart from cohesive conjunctions). I will show how the semantic types are manifested in the grammar, first in complexes and second in simplexes.

The reasons for this survey are as stated in Section II:2.1. There is another reason as well. The examination of the grammar in terms of the recurrence throughout it of projection, expansion, and their subtypes will be a key to an approach to certain problems in the Nigel framework to be discussed below in Section II:3.3.

2.2.2.1 The relations

The logico-semantic relations generalize and add to relations found in certain traditionally recognized constructions, viz:

Relation identified by Halliday		Traditionally recognized relation
projection		reporting (indirect speech) & quoting (direct speech)
expansion	elaboration	apposition & non-defining relative clauses
	extension	coordination
	enhancement	(adverbial clauses)

Fig. II:2-9: Relationship to traditional categories

As a starting point, I will quote Halliday's (1985) characterizations of the logico-semantic relations, which are tabulated below together with examples of subtypes and examples of clause complexes.

i. projection: "the secondary clause is projected through the primary clause, which instates it as (a) a locution or (b) an idea" (p. 196)

ii. expansion: "the secondary clause expands the primary clause, by (a) elaborating it, (b) extending it or (c) enhancing it" (p. 196)

ii.i. elaboration: "one clause expands another by elaborating on it (or some portion of it): restating in other words, specifying in greater detail, commenting, or exemplifying" (p. 196)

ii.ii. extension: "one clause expands another by extending beyond it: adding some new element, giving an exception to it, or offering an alternative" (p. 197) "the 'extending' relationship, as a relationship between processes, is essentially additive; it is the 'and' relation of co-ordination, as in *John came in and sat down.* As a relationship between things it is a kind of having. The basic meaning is that of adding something, a possession being an addition to its possessor." (p. 379)

ii.iii. enhancement: "one clause expands another by embelleshing around it: qualifying it with some circumstantial feature of time, place, cause or condition" (p. 197) "The 'enhancing' relationship, which as a relationship between processes is one of conditioning or qualifying with some circumstantial feature, as a relationship between things is the process of 'being at (etc.)'; ... " (p. 379)

The relations are tabulated below together with category meanings, examples of subtypes, and examples.

relation		category meaning	examples of subtypes	examples
projection	locution	'say'	imperating, indicating	they say that he is brilliant
	idea	'think'	cognitive, desiderative, ...	I think he's brilliant
expansion	elaboration	'i.e, e.g.'	restating, exemplifying, clarifying, ...	He's brilliant; he's a genius
	extension	'and, or'	additive, alternative, replacive, ...	He's brilliant and he's very humble
	enhancement	'so, yet, then'	causal-conditional,	He's brilliant so he never studies

Fig. II:2-10: Types of projection and expansion

Let's now turn to the manifestation of the relations in

(i) complexes at clause rank and group rank (Section 2.2.2.2); and

(ii) in the simple clause (Section 2.2.2.3).

2.2.2.2 Complexes at clause and group rank

I will start with the manifestation of the relations in the formation of complexes at clause rank and at group rank. I will consider complexes of the verbal group, nominal group, adverbial group, and prepositional phrase. A relation of projection or expansion may hold between clauses at clause rank or between

groups/phrases at group/phrase rank; that is, the relation may have either clauses or groups as its domains:

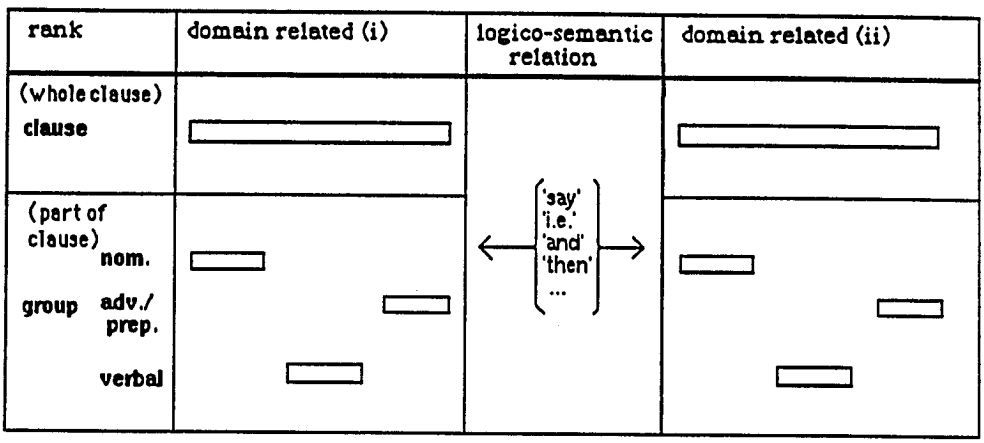


Fig. II:2-11: Recurrence of logico-semantic relations

For example, the relation of elaboration can be found in clause complexes as well as the various types of group complexes:

clause: `He went home for Christmas; he flew to Tampa.`

verbal group: `He went -- flew -- home for Christmas`

adv. gp. / pr. phrase: `He went home -- to Tampa -- for Christmas`

Further examples are given in the table below in Figure II:2-12.

		projection	expansion		
			elaboration	extension	enhancement
clause		He told us "Leave!"	He squeeled; he told us	He gave up and told us the whole truth	He was exhausted so he gave up
		He told us to leave	He told us, which was a relief	Besides giving up, he told us the whole truth	Because he was exhausted, he gave up
group	nom.		The captive, Jones, (has fled)	The captive and Jones (have fled)	Smith and then Jones (have fled)
			The prisoner, in a white suit, (has fled)	Smith instead of Jones (has fled)	
	adv. prep.		(S flew) to his hometown, to Tampa	(S flew) to Tampa and to Miami	(S flew) to New Orleans then to Tampa
			(S flew) from New Orleans to Tampa	(S flew) to Tampa as well as New Orleans	(S flew) east to Tampa
	verb.		(S) went, flew, (to Tampa)	(S) drove and flew (to Tampa)	(S) drove then flew (to Tampa)
		(S) wants to fly (to Tampa)	(S) seems to fly (to Tampa every Tu.)	(S) tried to fly (to Tampa)	(S) began by flying (to Tampa)

Fig. II:2-12: Complexes at clause and group rank

As we can see, the relations are not equally distributed among these different classes of groups/phrases; we would see further differences if I had taken the table further in delicacy, for example from enhancement to the various subtypes of enhancement (causal-conditional, temporal, spatial, manner, etc.). Expansion is more pervasive than projection, which is not surprising. Since projection is

essentially a relationship between processes, we find it with clauses and verbal groups, both of which deal with processes, but not with nominal groups, adverbial groups, or prepositional phrases. Furthermore, projection only comes in a hypotactic variant in the verbal group; there is no verbal group complex where one group serves to project another group as a quotation.

Within expansion, elaboration and extension seem to be the most pervasive. Although we find enhancement at group rank as well as at clause rank, it is more restricted at group rank; Halliday (1985: 252) notes that instances of enhancement are less common at group rank since "the meanings are too specific to be readily expressed as a relationship between units smaller than clauses".

2.2.2.3 Projection and expansion within simplexes

I have presented a brief overview of how the relations of projection and expansion relate units into complexes. We also find the semantic types within simple units. I focus on the clause; it will be the most important unit in the discussion in Section II:3.3 of grammatical metaphor.[8] The relations correspond to (i) circumstances in the transitivity structure of the clause and (ii) the relational process in a relational clause. For example:

[8] To the extent that groups can be analysed as word complexes, the relation types are also of interest for simple groups (cf. Section II:3.2.3).

(i) circumstance: locative-time

We left the party at eight

(ii) relational clause, participation: time

The historical plays precede the comedies

(i) With circumstances in the clause the semantic types do not serve to relate one unit to another to form a complex unit. Instead, the focus is on one constituent whose function corresponds to some aspect of projection or expansion.

(ii) In relational clause, we find the three types of expansion. The expanding relation corresponds to the process (*precede*) and it relates two participants (*the historical plays, the comedies*). It thus differs from the clause complex, where expansion can produce indefinitely long chains of clauses.

Both circumstances and relational clauses may involve grammatical metaphor, typically through a nominal group that is a nominalization. Nominalizations will then correspond to clauses in an 'agnate' clause complex.[9] For example, the following non-metaphorical circumstance of time can be contrasted with a metaphorical one, which is related to a clause complex:

[9] The clause complex is not agnate in the usual sense, since there is no grammatical system that relates it to the clause containing the nominalization. I will return to this issue in Section II:3.3: we have to consider how a generation grammar might deal with the alternation.

clause complex	We left the party ‖ and then Henry arrived	congruent — 2 processes
	We left the party ‖ before Henry arrived	
clause	We left the party before Henry's arrival	metaph. — 2 processes
	We left the party before eight	1 proc.

Fig. II:2-13: Time in clause complex (taxis) and clause (circumstance)

We can now consider projection and expansion in general in the clause, both congruent and metaphorical. Examples are tabulated below.

		projection	expansion		
			elaboration	extension	enhancement
clause complex		He told us "My friend has left"	He squeeled; he told us	Smith flew to Tampa and so did Jones	There was a bargain fare so he flew to Tampa
		Smith told us that his friend had left	Smith, who was a prisoner, was very cooperative	Besides Jones flying there, Smith flew to Tampa	Because there was a bargain fare, he flew to Tampa
clause simplex	circumstance: non-metaphorical	SOURCE According to S., his friend had left (MATTER S. told us about his friend)	ROLE As a prisoner, Smith was very cooperative	ACCOMPANIMENT Smith flew to Tampa with Jones	CAUSE Because of the bargain fare he flew to Tampa LOCATION - TIME He flew to Tampa yesterday LOCATION - SPACE EXTENT - TIME EXTENT - SPACE MANNER
	circumstance: metaphorical	(MATTER S. told us about his friend's departure)		ACCOMPANIMENT Jones charged with a cry	CAUSE Because of his collapse he needed rest LOCATION-TIME After his arrival he went straight to the hotel etc.
	participation	(verbal - RANGE	rel: intensive	rel: possessive	rel: circumstantial
		S. told us the news	Smith is the prisoner Smith is a prisoner	Smith has a friend	The fence surrounds the estate
		S. asked us a question)			His marriage predated the bancruptcy

Fig. II:2-14: Semantic types in clause (simplex)

Here are some natural examples to accompany the table.

extension ~ accompaniment

clause complex: hypotactic & extension

The Marquesa, *beside* not having heard the scurrilous songs, was in other ways unprepared for the actress's visit. (Wilder, p. 25)

clause: circumstance: accompaniment

Thus on the night following the scandal in the theatre she wrote Letter XXII and retired to bed *with* a carafe. (Wilder, p. 25)

2.2.2.4 Two examples

I will exemplify two types in some more detail. The point is to see how the recurrence of the semantic types allow us to achieve similar results in different grammatical contexts.

(i) elaboration

I will take the first example from encyclopaedic entries, Wilson's *100 Dinosaurs from A to Z.* One of the writer's tasks is to gloss the learned names of dinosaurs by giving their meanings. To accomplish this, he uses the grammatical resources of elaboration. He uses two strategies, viz.:

clause: intensive relational --- 'x means y'; and

nominal group, complex: elaborating --- 'x i.e. y '

The two strategies are exemplified below.

clause: intensive relational

The name Acrocanthosaurus means "very spiny lizard" (p. 6)
The word sauropod means "lizard feet" (p. 7)Altispinax means "high thorn" (p. 8)

nominal group: elaborating complex

ankylosaur -- or "armored dinosaur" (p. 6)
the titanosaurids, or "giant lizards" (p. 7)
the group of tyrannosaurids, or "terrible lizards" (p. 7)
Anchiceratops - "near horned face" (p. 9)

(ii) projection

As the second example, I will take the task in news reports of assigning the source and responsibility for what is reported. The strategies of projection identified in the tables above in Figures II:2-12 and II:2-14 are projecting clause complexes, clauses with a specification of source, and projecting verbal group complex --

clause complex: ' (1/α :) x says || (2/β:) ...'

clause: '[according to x] ...'

verbal group complex: '(α :) be said/rumoured (β:) to do'

All three strategies are used to establish the status of the news in news reports. In **clause complexes,** the projected clause is either quoted or reported; here is an example of the latter:

> *The world's largest film and camera maker said* it will not only sell its South African business, as companies have done, but will refuse to sell any products to South African customers. (Time, 1/xii/86)

In **clauses,** the source of the information is represented as a circumstance:

> [*According to the panel,*] the hazards become significant at 20% or more above the "desirable weight," as determined by averaging the values shown on the 1983 Metropolitan Life Insurance tables. (Time, 25/ii/85)

cf. also 'viewpoint':

In Washington's view, the U.S. relationship with South Korea, where the U.S. still bases 39,000 troops, is too vital to let the Kim incident affect it. (Time, 25/ii/87)

Here are two examples where the two strategies, clause complex and clause, are used in succession:

[*According to Kodak,*] its South African revenues were less than 1% of its $ 10 billion worldwide sales last year. (1:) *Said Kodak Chairman Colby Chandler:* (2:) "We cannot see with any certainty a time when South Africa will be free from apartheid. The implication of that situation is a degree of business risk that we do not consider prudent." (Time, 1/xii/86)

[*According to this document*], which has been dubbed the "Ollie Chronology," the idea of an arms sale was presented to Reagan in August 1985, but (1:) *he responded:* (2:) "No, do not authorize." (Time, 15/xii/86)

In the **verbal group**, projection creates hypotactic complexes of verbal groups. The source of the information is not, of course, specified in the projecting verbal group, as it is in a projecting clause; but the projected status is

Indeed, Suárez (α:) *is said* (β:) *to be* a great benefactor. (Time, 25/ii/85)

(cf., with a projecting clause complex: *They say that Suárez is a great benefactor.*)

In addition to the three strategies just illustrated, a projecting clause complex can also be represented metaphorically as a **nominal group** (cf. Section II:3.3.4.3.1). The projecting clause is nominalized and the projected clause is embedded as a postmodifier:

> Fragmentary and sometime contradictory, the revelations included *the assertion by Amiram, Israel's adviser on counterterrorism to Prime Minister Yitzhak Shamir,* ⟦that the U.S. decided what price Iran should pay for the American arms⟧. (Time, 15/xii/86)

2.2.3 A brief note on the textual & interpersonal views

We have seen that certain very general semantic categories emerge as recurrent principles of organization in the ideational view of the grammar. To complement this ideational picture, we can briefly adopt a textual view and an interpersonal view of the grammar.

In a sense, the **textual** cohesive resources of ellipsis / substitution stand outside the rank scale of the grammar. That is to say, while they operate within groups and clauses, the basic principle is the same wherever ellipsis or substitution occurs; they are used to present 'continuity in the environment of contrast' (Halliday & Hasan, 1976). For instance, we find substitution throughout the grammar in the context of a logical structure:

clause (as dependent in clause complex): Is he coming tomorrow?

α: I believe || β: <u>so</u>. // α: I think || β: <u>not</u>.

noun (as head in 'noun complex', i.e., nominal group): You gave me a red marker but I asked for a β: blue α: one.

verb (as final dependent in 'verb complex', i.e., verbal group): Have you watered the lawn? No, I thought you α: had β: done.

The nature of ellipsis / substitution is important because it is part of a generalization about the textual metafunction: like ellipsis / substitution, information is 'rank-transcendant'; I will return to this characteristic in Section II:3.2.5.

Although theme is clearly a clause region, the thematic principle is built into the structure of the verbal group and the nominal group as well: the thematic starting point is the deictic element in both groups (see Halliday, 1977).

Turning to the **interpersonal** metafunction, we find another kind of recurrence. Expressions of attitude are possible in clauses as well as nominal groups and lexical items (as connotations; see Section II:4.6); for example:

clause: Unfortunately, we'll have to postpone the trip.

nominal group: Our unfortunate two friends had lost their way again.

lexical item (connotation): The rascal is behind on his rent.

The interpersonal resources dispersed throughout the grammar may work together to create a prosodic effect or a pervasive colouring (cf. further Section II:3.2.5), as in the following example, taken from Halliday (1979: 66):

Christ they beat the hell out of those bastards

2.2.4 Variability in coverage

Grammars may vary in coverage along any of the three dimensions of metafunction, delicacy, and rank. If we are working with a particular grammar for text generation, it is useful to be able to close off the coverage or extend it along any of the three dimensions.

Metafunctional breadth. Although it would seem to be desirable for a text generation grammar to display full metafunctional breadth, most generation grammars have, in fact, been metafunctionally narrow. In particular, fairly little attention has been paid to the textual metafunction. It is possible to make a grammar work with less than full breadth by relying on *unmarked* choices. For example, we can define a grammar which always produces clauses with unmarked theme. Such a metafunctionally narrow grammar is dependent on the nature of the register for its successfulness. Thus, if we use a grammar which is only capable of producing clauses with unmarked themes to generate expository texts concerned with the definition of objects, it is likely to succeed

fairly well since the shifting topic in such texts also tends to be the Subject, which is the unmarked Theme.

Delicacy. It is possible to stop the move in delicacy and decide not to go any deeper in the grammar. The consequences of closing the grammar in delicacy are different depending on the purpose for which it is used. If we use it for text analysis, the feature indicative can represent declarative and interrogative without making the distinctions. However, if the purpose of the grammar is text generation, the situation is different. We could let the grammar stop at the feature 'indicative' and let declaratives and polarity-interrogatives be in free variation, since the difference is only the *absence* of two realization statements, Subject fl Finite (if declarative) and Finite fl Subject (polarity-interrogative); we can let Subject and Finite be in free variation. However, the grammar will not be able to generate wh-interrogative clauses since these require additional realization statements such as the insertion of Wh and the conflation of it with another function such as Subject. In general, we will have to pick one more delicate subtype as a representative of the whole class unless all the more delicate types can be generated in free variation without further realization statements.

Rank. The Nigel grammar started out as a clause grammar without any resources for generating groups and phrases. In text generation, it is, of course, necessary to move to ranks lower than the rank of clause, but it is possible for certain purposes to work with quite simple groups, as long as the preselections made in the clause grammar can be realized.

It is even easier to work without word grammar (morphology) in the development of a text generation grammar. For a long time, words and word structures were treated as unanalysed wholes in the Nigel grammar. There is no practical problem with doing this in a rank-based systemic grammar. As long as a set of features can be realized, it does not matter whether the realization is a single formal item or a structure.

2.3 Text-oriented grammar

We now have two fairly detailed lexicogrammatical maps -- according to a multifunctional 'projection' and according to an ideational one, and we can return to the question of how to produce a text generation grammar according to our maps.

2.3.1 Text in context

There are two sets of considerations to take into account. They are both due to the fact that we want a grammar for producing contextualized text. One deals with the general task of creating text and the other with the use of the grammar in specific contexts:

(i) Text: General considerations for a text-oriented grammar. These include its orientation towards semantics and its metafunctional diversity.

(ii) Context: Registerial considerations. These include observations about what demands specific registers may make as well as general observations about the influence of field, tenor, and mode on lexicogrammatical resources, for example the influence of mode on the type of lexicogrammatical complexity & intricacy.

I will deal with the first consideration in this section and turn to the second one in Section II:2.4.

2.3.2 Functional diversity

Of the three metafunctions, the textual one has tended to be underrepresented in traditional and formal grammars. It did not come into focus in linguistics until the pioneering work by Mathesius and other Prague School functionalists. Furthermore, this metafunction and the interpersonal one often suffer semantically in semantic frameworks based only on a truth-conditional approach.[10] Consequently, the ideational function has received most attention recently, which is particularly unfortunate for text production since the speaker-listener relation is of basic importance in that context. The same is true within work on text generation. Bateman et al. (1987) offer the following assessment:

[10] For example, Dowty et al. write that one will not find in their book on Montague semantics "or in truth-conditional approaches generally, much discussion of the semantics of non-declarative sentences." In other words, much of the richness of the interpersonal part of the clause is left unaccounted for since only one option, the declarative one, is pursued.

In general, the move to consider text has been based upon a simple extension of the notion of propositional content to cover the set of propositions asserted over a text and some of the logical / rhetorical relations holding among those propositions. This is *insufficient* for generating text because many aspects of text design are sensitive not to *core* meanings but to the *reasons* for choosing such meanings over any others in the particular context of a text's use. A specification of core meaning therefore omits much information that is crucial for text generation. Although there are linguistic approaches which have, at least in principle, accepted this, particularly approaches within the broad range of *functional* linguistics, the sheer pervasiveness of textually-conditioned phenomena has still not been sufficiently appreciated within the generation paradigm.

The conclusion for text-production grammars is that they have to show functional diversity and that special attention has to be given to interpersonal and textual areas. This is the view that follows from the systemic functional perspective.

2.3.3 Textual fluency

The kinds of grammatical resources which make a text flow fluently, including conjunctions, controlled use of emphasis and theme, must be in the scope of the grammar: that is, the grammar needs to provide the text generation system with textual resources. The grammar should be responsive to an incoming text plan, for example by being able to "highlight" the principle according to which the text is being developed (cf. further Section IV:3). The demand for fluency follows directly from the research task itself, to generate fluent multiparagraph texts.

Consider the following text (from Halliday, 1978: 134):

> Now comes the President here. It's the window he's stepping through to wave to the crowd. On his victory his opponent congratulates him. What they are shaking now is hands. A speech is going to be made by him. 'Gentlemen and ladies'. That you are confident in me honours me. I shall, hereby I pledge, turn this country into a place, in which what people do safely will be live, and the ones who grow up happily will be able to be their children.'

This text can safely be used as an example of a text that is "textually out of control." All the ideational and interpersonal meanings are conveyed, but the textual organization is, to say the least, infelicitous. The grammar that this text presupposes need not be a textually impoverished grammar; the point is that the textual domain is not controlled.

The main problem with the lack of control involves *marking*--there are marked choices of theme, use of theme predication (*It's the window ....*) and use of theme identification (*What they are shaking now is hands*). Marked choices are fine--as long as there are good reasons for them. The work on the Nigel grammar recognizes this, and a number of different textually relevant options of marking are controlled by choosers--theme marking, for example. If the hypothetical grammar of the text above had not been free to run wild in the area of theme marking, the result would have been decidedly better:

> Here comes the President now. It's the window he's stepping through to wave to the crowd. His opponent congratulates him on his victory. What they are shaking now is hands. A speech is going to be made by him. 'Gentlemen and ladies'. That you are confident in me honours me. I shall, I hereby pledge, turn this country into a place, in which what people do will be live safely, and their children will be able to be the ones who grow up happily'.

The text can still be improved; attention to THEME PREDICATION, THEME IDENTIFICATION, VOICE, and the sequence of gentlemen and ladies, in addition to theme marking, gives the following text.

> Here comes the President now. He's stepping through the window to wave to the crowd. His opponent congratulates him on his victory. They are shaking hands. He is going to make a speech. 'Ladies and gentlemen' It honours me that you are confident in me. I shall, I hereby pledge, turn this country into a place, in which people will live safely, and their children will be able to grow up happily'.

The ideational and interpersonal choices that underlie this text have been held constant; the improvement has been achieved solely by simulating

proficient textual control.

Let's now turn to examples of texts generated by generation systems and look at how the quality of a text may be decreased because of simple restrictedness of textual coverage. (My intention is not to criticize the generation systems that produced the text: the purpose may not have been to produce textually fluent text but to test some other aspect of text generation such as plot creation or text planning with the help of a simple generator.) Consider the following extract from a TALESPIN example (Meehan, 1977; cf. Section I:2.2):

> Once upon a time George ant lives near a patch of ground. There was a nest in an ash tree. *Wilma bird* lived in the nest. There was some water in a river. *Wilma* knew that the water was in the river. George knew that the water was in the river. One day *Wilma* was very thirsty. *Wilma* wanted to get near some water. *Wilma* flew from her nest across a meadow through a valley to the river. *Wilma* drank the water. *Wilma* wasn't thirsty any more.

One problem with this text is that there are only two ways of referring to the bird-- *Wilma bird* and *Wilma*. Ideationally, the text conveys Wilma's activities, but they're narrated in a monotonous way. One improvement would be to cover more of the textual resources of REFERENCE in the nominal group so that we could get, for example, *she* and *the bird*. Another improvement would be to cover SUBSTITUTION / ELLIPSIS so as to guide the reader's attention by avoiding repetition; for example, instead of generating

> Wilma knew that the water was in the river. George knew that the water was in the river.

the system might generate

> *Wilma* knew that the water was in the river and *so did* George.

Now consider the following partial account of how a loudspeaker works, taken from Paris & McKeown (1987); the account presupposes an introduction of the loudspeaker and a specification of its properties:[11]

> The variation of the current causes the field of the magnet to vary. When the current increases the field increases. Because the field increases the poles of the magnet attract the diaphragm of the loudspeaker. The poles attracting the diaphragm causes the diaphragm to spring forward. The current decreasing causes the field to decrease. This causes the poles to release the diaphragm. Because the poles release the diaphragm the diaphragm springs backward. The field varying causes the diaphragm to vibrate. Because the diaphragm springs forward, the soundwave intensity decreases. The diaphragm springing backward causes the soundwave intensity to increase. The vibration of the diaphragm causes the soundwave intensity to vary. The soundwave intensity varies, like the current varies.

There is fairly little indication of how the text is organized rhetorically. The rhetorical organization can by brought out by means of the resources of CONJUNCTION. Here is one possible reading:

> The variation of the current causes the field of the magnet to vary. <u>Thus</u>, when the current increases the field increases. Because the field increases the poles of the magnet attract the diaphragm of the loudspeaker. <u>The poles attr</u>acting the diaphragm causes the diaphragm

[11] Paris & McKeown note that they are "still working on the surface generator to produce smoother texts" and continue "However, as our emphasis in this work is on the content of a description, we are not studying the complexity and subtleties of surface choice." While there is a good deal more to the textual metafunction than 'surface choice', the point is that it was not the focus of the particular stage of the work Paris & McKeown report on.

to spring forward. Similarly, the current decreasing causes the field to decrease. This causes the poles to release the diaphragm. Because the poles release the diaphragm the diaphragm springs backward. In short, the field varying causes the diaphragm to vibrate. Then, because the diaphragm springs forward, the soundwave intensity decreases. Similarly, the diaphragm springing backward causes the soundwave intensity to increase. That is, the vibration of the diaphragm causes the soundwave intensity to vary. In summary, the soundwave intensity varies, like the current varies.

The conjunctions in this reading of the text are used to bring out the parallel between increase and decrease (*similarly:* 'increase ~ decrease'; *that is:* 'increase' & 'decrease' = 'vary') and the stages in the causal chain (*in short:* skipping the intermediate step between field variation and diaphragm vibration; *then:* next step in causal chain). This use of CONJUNCTION may not correspond to the way the text was organized or may not be supportable in the system, which is an important consideration: just as the ideational resources of the grammar need the support of a knowledge base, the textual resources presuppose a good deal of information from the environment of the grammar; this issue will be taken up again in Chapter IV.

The value of the identification and use of conjunctive relations such as contrast is clear from the quality of the texts produces by Davey's (1978) Proteus system:

The game started with my taking a corner, and you took an adjacent one. I threatened you by taking the middle of the edge opposite that and adjacent to the one which I had just taken but you blocked it and threatened me. I blocked your diagonal and forked you. If you had blocked mine, you would have forked me, but you took the middle of the edge opposite the corner which I took first and the one which you had just taken and so I won by

completing my diagonal.

The loudspeaker text might also be improved by means of the textual resources of REFERENCE, SUBSTITUTION & ELLIPSIS, and LEXICAL COHESION. For example, there is a good deal of repetition of *cause* and 'synonyms' such as *lead to, make,* and *result in* might break the monotony of repetition (cf. Section II:4.7). Here's a version of the text which relies on REFERENCE, SUBSTITUTION & ELLIPSIS, and LEXICAL COHESION:

> The variation of the current causes the field of the magnet to vary. Thus, when the current increases the field increases. Because the field increases the poles of the magnet attract the diaphragm of the loudspeaker. *This attraction makes* the diaphragm spring forward. Similarly, the current decreasing causes the field to decrease. This *leads* the poles to release the diaphragm. Because *they do this, it* springs backward. In short, the field varying causes the diaphragm to vibrate. Then, because the diaphragm springs forward, the soundwave intensity decreases. Similarly, the diaphragm springing backward *makes* the soundwave intensity increase. That is, the vibration of the diaphragm causes the soundwave intensity to vary. In summary, the soundwave intensity varies, like the current varies.

We have seen that it is important for a text generation grammar to be textually resourceful, relying on regions such as THEME, CONJUNCTION, REFERENCE, and SUBSTITUTION & ELLIPSIS. I will now turn issues of grammatical coverage that are related to the register or registers chosen for the generator.

2.4 Contextual considerations: register and coverage

The most detailed specification of coverage needed for a text generation grammar is also the least general one. It is the specification of the coverage needed for a particular register or subregister. As we will see, there are certain general tendencies in register variation. We also see that it is also possible to make certain general observations about the relationship between a register-specific grammar and the 'general' grammar.

2.4.1 General tendencies in register variation

The context of use that a particular generation task constitutes determines how the lexicogrammatical resources are used. This general observation about functional variation was very clearly identified in Prague School work; for example, in discussing the functional differentiation of the the standard language, Havránek (1932) notes:

> The functional and stylistic differentiation of language is most conspicuously based on a utilization of its lexical and syntactic aspects, but phonological and morphological devices are used as well, though to a lesser extent. ... The various devices, primarily lexical and syntactic, of functional and stylistic differentiation do not, however, consist merely of an inventory of different words or grammatical forms, but *also of different modes of utilization* of the devices of the language or the special adaption to the different purposes of the standard language. (My italics, CM)

I will return to the issue of different modes of utilization in the chapter on semantics (Section III:6): one way of addressing this kind of differentiation is by

setting up different semantices for different contexts of use, as suggested in Halliday (1973). Here I will continue to focus on lexicogrammatical coverage.[12]

(i) Genre

Variation in lexicogrammar according to use has been approached through the notion of **genre**. For present purposes, we can take genre to be the type of text used in a particular context. The genre a text instantiates tells us something about what grammatical resources are used. In other words, given a particular genre, we can, in principle, say a good deal about what coverage is needed for our text generation grammar.[13] However, this is an area where much descriptive work is needed.

Longacre's (1976) genre typology may serve as a starting point. He identifies four different genres, viz. narrative, procedural, expository, and hortatory. They are distinguished in terms of two parameters: is the text prescriptive or not; is is organized by succession or not? The four genres differ with respect to TENSE,

[12] In a sense, this lexicogrammatical focus corresponds to the early notion of register in systemic linguistics, before semantics was brought into focus (as in Halliday, 1978, e.g. p. 35). Halliday, McIntosh & Strevens (1964: 88-9) write: "Registers ... differ primarily in form. Some registers, it is true, have distinctive features at other levels, such as the voice quality associated with the register of church services. But the crucial criteria of any given register are to be found in its grammar and lexis. Probably lexical features are the most obvious. ... Purely grammatical distinctions between the different registers are less striking, yet there can be considerable variation in grammar also. Extreme cases are newspaper headlines and church services; but many other registers, such as sports commentaries and popular songs, exhibit specific grammatical characteristics."

[13] If we look at key patterns such as those identified by Longacre in Figure II:2-15 below, we find that they are typically differentiated within a given genre according to the elements of its generic structure (cf. e.g. Hasan, 1984). For instance, the tense selections in the placement of a story are often different from those of the initiating and subsequent events. In general, the multivariate elements of a generic structure are realized by different patterns of selection in the grammar.

PERSON, MOOD, and so on:

	- Prescriptive	+ Prescriptive	
+Succession	**Narrative**	**Procedural**	
	First/third	nonspecific	person
	Agent	Goal	orientatation
	accomplished	projected	time
	chronological		linkage
-Succession	**Expository**	**Hortatory**	
	any (usual third)	second	person
	subject matter	addressee	orientatation
	not focal	mode, not time	time
	logical		linkage

Fig. II:2-15: Genres and grammatical characteristics according to Longacre

Martin & Peters (1985) offer a more detailed characterization of the grammatical patterns of narration and exposition.[14] The characterization is a "provisional hypothesis" and the particular properties they identify are to be taken as "tendencies", not as absolutes. I have adapted their table and added a heading for procedural text.

[14] They contrast narration and exposition briefly as follows: "Narration is concerned with what happened, often from the point of view of participants involved in what happened; exposition, on the other hand, is about the way things are, from the perspective of the observer. The difference between these two broad generic categories is learnt very early by children in school."

lexicogrammar grammar		narrative	exposition	procedure
clause	logical: clause complex	complex: paratactic extension & enhancement	simple; paratactic extension & elaboration	complex: paratactic extension & enhancement hypotactic enhancement
clause	experiential: transitivity circumstance	material location: time & space	material [general time] location, cause & manner	material manner
clause	interpersonal: mood	declarative	declarative	imperative
clause	textual: conjunction	external: temporal succession	internal & external; varied, including	external: addition, temporal succession
n.gp.	experiential:	concrete; specific	concrete & abstract; (facts); nominalization	concrete
v.gp.	ideational: tense	specific time; past	general time; simple present	(nonfinite)
lexis		concrete; non-technical	concrete or abstract; technical	concrete; technical / non-technical

Fig. II:2-16: Some genres and lexicogrammatical resources

The table can be illustrated in parts by means of a paragraph from each type of genre. Let's start with a narrative paragraph:

One evening, when the Boy was going to bed, he couldn't find the china dog that always slept with him.
"Here," said Nana, who ruled the nursery. "Take your old Bunny. He'll do to sleep with!"
That night, and for many nights after, the Velveteen Rabbit slept in the Boy's bed.
(Williams)

Projection plays an important part in clause complexes, since it is used to relate the narration to the dialogue (*"Here," said Nana*). The circumstances include temporal locatives (*one evening, that night*). The process types are material and verbal (*go, find, sleep; say,* etc.). The mood is declarative. (It's much more variable in the dialogic spans, of course.) The tense is the simple past, representing specific (/ habitual) time. (Again, it's much more variable in the dialogic spans.) Next, consider the following expository paragraph, taken from a children's book on dinosaurs.

> Stegosaurus (steg-o-SAWR-us) was a very different-looking dinosaur. Two rows of sharp bony plates ran along its back, and there were four huge spikes at the end of its powerful tail. This new kind of plant-eater walked on all four legs.
>
> (Dinosaurs)

The clause complex is extending (*Two rows of sharp bony plates ran along its back, and there were four huge spikes at the end of its powerful tail*), serving to add further exposition. The processes are relational (*be, run, be*) and material (*walk*). The mood is declarative throughout. The tense is simple past, but it represents general past time rather than specific past.

Finally, consider the following instructional paragraph, taken from a car repair manual.

> Using a 10mm flare nut or open end wrench, unscrew the brake hose fitting. Some brake fluid will ooze out. Then use a 10mm wrench to remove the two cylinder mounting nuts. Remove the lock-washers of the nuts. Next remove the black rubber cap on the end of the brake bleed screw. Then use an 8mm wrench to remove the break bleed screw. Loosen the cylinder by tapping the top of it with

a wrench. Now grab the tops of the brake shoes and pull them away from the rear wheel cylinder. If you can't do this, remove the upper return spring(s) following the instructions in Step 2 of Procedure 8: Rear Brake Shoe Replacement. Finally, wiggle the cylinder out and away from the brake backing plate.

(Cisin & Parvin, p. 129)

The clause complexes are enhancing, e.g. purposive (*Then use an 8mm wrench to remove the break bleed screw*). The processes are all material (*use, unscrew, ooze, remove, loosen, tap,* etc.) and are virtually all effective; they are concrete operations on concrete participants. Circumstances of manner are likely, although there is only one example in the excerpt, of the subtype means (*with a wrench*). The instrumentality represented by the circumstance of means is also represented by means of *use.* The mood is imperative with the exception of a declarative caution and a dependent condition. The conjunctions are external, temporal (*then, next, now, finally*).

The three excerpts serve to illustrate the functional differentiation in the use of grammatical resources in different genres. When we work on a text generation grammar, we can take advantage of this differentiation. For example, if we wanted to build a generator of car repair instructions, its grammar would have to cover imperative clauses of a certain subtype (*Loosen the cylinder,* but not *You loosen the cylinder; Loosen the cylinder, will you; Let's loosen the cylinder;* and *Let me loosen the cylinder*) but not interrogative ones, expanding clauses complexes but not projecting ones, material clauses but not verbal ones, and so on.

If we then moved to the new task of building a recipe generator, there would be much less work involved than in a move to for example the generation of weather forecasts, since repair instructions and recipes are generically much closer to one another than repair instructions and weather forecasts. The simple principle is that the typology of genres is not flat but has a good deal of variability in delicacy. The more delicate the specification of the genre is, the more detailed the guidelines for what the grammar should cover can be and, at the same time, the smaller the area of applicability.

At this point, I might try to make further generic differentiations and also broaden the spectrum of genres considered from narration, exposition, and instruction. This is an important undertaking and also a huge one, of course. It has to be based on solid textual studies and the methods used are important; cf. Biber (1986). However, the basic question is what aspects of context underlie genre differentiation and the lexicogrammatical differences associated with them.

(ii) The controlling variables: field, tenor, and mode

The genres themselves and the differentiations in patterns of grammatical selections we can observe from one genre to another derive from the components of context (cf. Section I:1.2) -- field, tenor, and mode: see e.g. Halliday (1978) and Halliday & Hasan (1980, 1985). For example, Longacre's two parameters, +/- succession and +/- prescriptive, are, in fact, just two of a set of relevant dimensions within field, tenor, and mode. Succession has to do with

organization within field and prescription with rhetorical mode within mode.

As noted in Chapter I, Halliday has found that the contextual components and the metafunctional components of lexicogrammar are systematically correlated. He describes this as follows (1978: 143):

> The environment, or social context, of language is structured as a *field* of significant social action, a *tenor* of role relationships, and a *mode* of symbolic organization. Taken together these constitute the situation, or 'context of situation', of a text.
>
> We can then go on to establish a general principle governing the way in which these environmental features are projected onto the text.
>
> Each of the components of the situation tends to determine the selection of options in a corresponding component of the semantics. In the typical instance, the field determines the selection of experiential meanings, the tenor determines the selection of interpersonal meanings, and the mode determines the selection of textual meanings.

Halliday & Hasan (1985: 26) tabulate the relation of the text to the context of situation as follows.

SITUATION: Feature of the context	(realized by)	TEXT: Functional component of the semantic system
Field of discourse (what is going on)		Experiential meanings (transitivity, naming, etc.)
Tenor of discourse (who are taking part)		Interpersonal meanings (mood, modality, person, etc.)
Mode of discourse (role assigned to lg)		Textual meanings (theme, information, cohesive relations)

Fig. II:2-17: Situation and text

For instance, variation in the dynamicness of the field will lead to variation in process type and the degree of technicality will influence the use of ideational grammatical metaphors (cf. Section II:3.3). Within tenor, affect and the power relation between the interlocutors influence interpersonal choices in mood and modality and the use of interpersonal metaphor. Finally, the mode distinction between writing and speech influences the degree of grammatical complexity and the use of grammatical metaphor (see Halliday, 198).

In short, a careful consideration of the field, tenor, and mode of various generation tasks can give us principles guidelines for determining priorities in coverage for the generation grammar.

2.4.2 The relationship between general grammar and specific uses

What happens if we approach the question of coverage from the specific situation type in which the need to generate arises? If we are not trying to build a general resource, this may be the only approach we need to consider: we simply build a lexicogrammar for stock market reports, weather forecasts, recipes, etc.. However, when the task is to build a general resource, the approach from a specific situation type becomes a complementary one. Any instance of generating a text is an instance in a specific situation, which is a token of a specific situation type. So we need to 'fine-tune' the general lexicogrammar for these specific generation tasks. The central question is, then, what the relationship between the general lexicogrammar and situation specific ones is.

To explore the nature of the relationship, I will sketch a lexicogrammar of recipes. The most important observation is that that grammar is an *abbreviation* of the general lexicogrammar. Before we look at the grammar in any detail, let me sketch the relationship between the context of situation -- the field, tenor, and mode -- and the grammatical resources.

The **field**, what is going on, is how to make a dish; culinary operations. It is realized by material processes with the reader-cook as actor and ingredients as goal; process complexes reflect the temporal sequence of the culinary operations.

The **tenor**, the role relationship between writer and reader, is expert to non-expert with the non-expert coming to the text to be instructed. It is realized by commands, which, if performed, will lead to a dish. Since the reader comes to the text of his or her own accord to be instructed, there is no use of the linguistic resources to achieve politeness.

The **mode** is written instruction. There is no dialogic interaction between writer and reader, even though the instruction may appear on the terminal screen. Since the rhetorical mode is instruction, the reader is natural as unmarked and implicit Theme. The instructional mode increases the likelihood of process-oriented themes, in particular Means, such as *with a knife.*

Let's start with a particular recipe and make some observations about the lexicogrammatical system illustrated by it. Here is a recipe for almond and apricot stuffing:

```
Almond and apricot stuffing

1 oz. butter or suenut
2 large chopped onions
4 oz. coarsely grated or chopped almonds
6 fresh or about 12 soaked apricots, diced finely
1 tablespoon chopped fresh herbs
Grated zest and juice of 1/2 lemon
Sea salt and brown sugar to taste.

Melt the fat and fry the onions until slightly brown,
add the almonds and continue cooking for 3-5 minutes.
Remove from the heat and add the remainder of the
ingredients.

This makes a very good stuffing for cucumbers. If you
want a more substantial stuffing add a little mashed
potato and use for stuffing marrows.
```

(Highton & Highton, p. 127)

As we will see, the lexicogrammar helps construct a procedure -- sequences of operations -- by means of certain types of clause complex. The clause complexes are all expansions; there are no projections in the text -- for example: β^{x}: *If you want a more substantial stuffing potato* α $2^{+}\alpha$: *and use* α $2^{+}\beta^{x}$: *for stuffing marrows.* Generalized paratactic expansion, 'and', is central -- possibly interpreted as expansion: enhancement: sequence. Furthermore, hypotactic enhancement serves to condition processes temporally (*until*) or conditionally (*if*).

Within the clause, TRANSITIVITY selections are predominantly material & effective -- various operations on food items: *melt, fry, add, cook, remove,* and *use* are the verbs realizing Process. There is also one relational example (ascriptive): *This* <u>*makes*</u> *a very good stuffing for cucumbers.* There are no equative relational clauses nor any verbal ones. There is one mental clause (reactive: desiderative) with the reader as Senser: *if you want a more substantial stuffing.*

MOOD selections are imperative: jussive (*add a little mashed potato*) or declarative (*This makes a very good stuffing for cucumbers*), both of which are untagged. There are no interrogative clauses. Dependent clauses are limited to the subtype enhancing (*until-, if-*).

This brief example gives the general flavour of what the lexicogrammar of recipes is like. I will now turn to a discussion of the system underlying recipes, using clause complexes as an illustrative case study.

We can set up the following system network fragment for clause complexes.

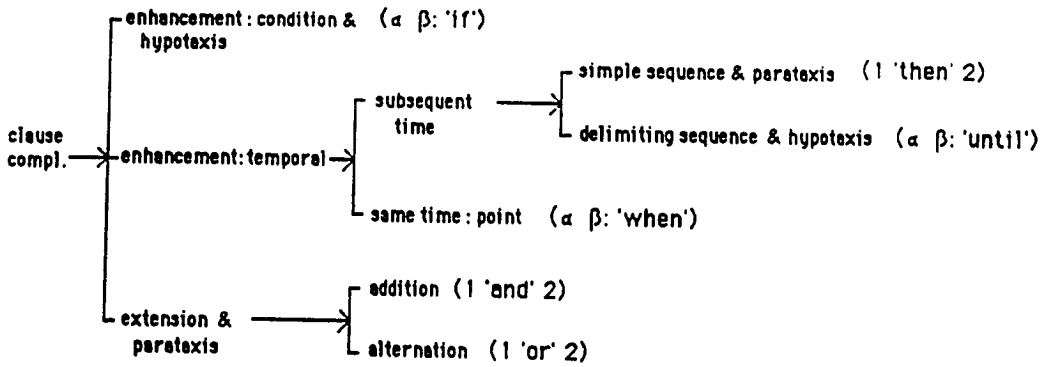


Fig. II:2-18: The recipe grammar of clause complexes

Each selection is illustrated below:

extension & parataxis: addition /alternation

Prepare the carrots <u>and</u> shell the peas.

Either slice some vegetables finely <u>or</u> grate them coarsely

enhancement: subsequent time: simple sequence & parataxis

Butter the inside of each roll and its lid, <u>and then</u> butter the outside.

enhancement: subsequent time: delimiting sequence & hypotaxis

Stir all together with a fork <u>until</u> well heated through.

enhancement: same time & hypotaxis: point [temporal condition]

When all the pancakes are made garnish the dish and serve with cheese and egg sauce.

enhancement: causal-conditional & hypotaxis: conditional

If you want a more substantial stuffing add a little mashed potato and use for stuffing marrows.

enhancement: causal-conditional & hypotaxis: purposive

If you want a more substantial stuffing add a little mashed potato and use for stuffing marrows.

This system network relates to the general one in the following ways:

(i) it represents a 'reduced' potential &

(ii) it skips certain steps in delicacy;

(iii) it collapses certain independently variable systems.

To see how this works, let's consider the general system network. (The features chosen in the context of recipes are underlined to indicate the restricted use of the potential; only the most delicate feature on any path is marked. Certain features entail other features in the 'recipe grammar' but not in the general case; these entailments are marked by x† and y*, which means 'if feature x is chosen, also choose y', and x†† and y**. These marking conventions will be discussed in detail in Section II:3.1.)

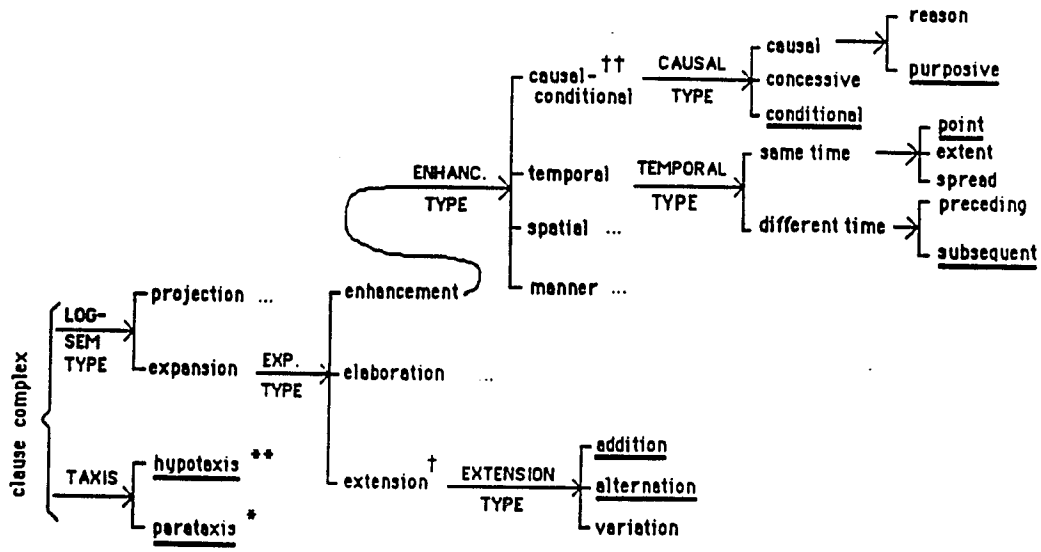


Fig. II:2-19: The general grammar of clause complexes

The potential of the system LOGICO-SEMANTIC TYPE is reduced. The option projection is never chosen and the only feature ever chosen is expansion. Consequently, the recipe grammar can be abbreviated by deleting this system altogether: clause complexes are invariably expansions.

The potential of the system EXPANSION TYPE is also reduced. Of the three options elaboration, extension, and enhancement, only the latter two are chosen. The systems ENHANCEMENT TYPE and EXTENSION TYPE are

similarly reduced. Of the various types and subtypes of enhancement, only temporal and conditional are chosen; for example, there are no spatial, comparative, or concessive options in the grammar of recipes.

In the general grammar, the systems TAXIS and LOGICO-SEMANTIC TYPE together with more delicate systems are simultaneous and independently variable; but in the recipe grammar, they are not independently variable. If the clause complex is conditional (*if-*) or temporal limit (*until-*), it is also hypotactic, not paratactic. If it is extending or a temporal sequence, it is paratactic. Consequently, the systems TAXIS and LOGICO-SEMANTIC TYPE together with its dependent systems are collapsed in the recipe grammar in the system hypotactic & logico-temporal condition / paratactic.

Similar observations can be made within the clause for TRANSITIVITY and MOOD.

2.4.3 Capturing 'restricted' grammars

Let me repeat the relationship between a specific grammar and the general one; the specific grammar:

(i) represents a 'reduced' potential &

(ii) skips certain steps in delicacy;

(iii) collapses certain independently variable systems.

How can we capture and make use of the restricted nature of a situation-specific grammar such as the recipe grammar? There are at least three strategies:

(i) we simply define the situation-specific grammar and use it instead of the general one;

(ii) we retain and use the general grammar and define the situation-specific grammar in terms of the general one by means of sets of preselections; or

(iii) we retain and use the general grammar and reinterpret the situation-specificity in terms of semantics rather than lexicogrammar.

(i) The first strategy is of interest if we are building a task-specific generator, such as a recipe generator, a weather forecast generator, or a stock market report generator. It does not have any value as a theoretical principle if our goal is to build a general-purpose text generator. Now, if we are building a task-specific generator, we can use the general grammar as a type of reference resource. But we can also customize -- reduce and revise -- an actual copy of it.

The other two strategies are of more general interest. Both of them assume that the general grammar is used for a variety of generation tasks.

(ii) The second strategy is a way of defining the grammar used in a specific register in terms of the general grammar by means of grammatical statements that restrict the potential of the general grammar.[15] For example, as part of our characterization of the grammar used in writing recipes, we can specify local preselections (cf. Section II:1.2) such as the following:

CLAUSE COMPLEX -- LOGICO-SEMANTIC TYPE: 'expansion'; that is, if a clause is complex, it is also automatically an expansion rather than a projection.

MOOD -- INDICATIVE TYPE: 'declarative', TAGGING: 'untagged'; that is, if a clause is indicative, it is also automatically declarative; and it is also always untagged.

TRANSITIVITY -- MATTER: 'non-matter', ROLE: 'non-role', CAUSE TYPE: 'purpose', etc.; that is, a number of circumstances are either never selected or are limited as to subtype. Further, TYPE OF BEING: 'ascriptive', SENSING: 'reactive', REACTION TYPE: 'liking'.

These are just a few examples. Each preselection means that it is not necessary to engage the chooser of the system (cf. Section II:1.2.1.5.2) to determine which feature to select. Certain statements would actually involve preselections in more than one system, for example TAXIS: hypotactic & ENHANCEMENT TYPE: 'causative'.

[15] If we build a grammar-based semantic interface such as the chooser and inquiry interface discussed in Chapter IV, we can also state the restrictions in terms of this semantic interface by predetermining responses to inquiries that will always be the same in a given register. Since I haven't introduced the chooser and inquiry interface yet, I only discuss restrictions stated directly in terms of grammatical features here.

There are also a number of systems for which we could state disjunctive preselections, thereby reducing the overall alternation that has to be considered. For example, PROCESS TYPE: material / mental / relational (excluding 'verbal') and CAUSATIVE ENHANCEMENT TYPE: 'condition' / 'purpose' (excluding 'reason' and 'concession'). The choosers of these systems would still have to be engaged but they would have a reduced task to take care of, since only certain alternatives would have to be considered. The question is how to represent this reduction in terms of the choosers. One possibility is to explore the strategy in (iii) below.

(iii) The third strategy is to set up different semantic interfaces for different registers. I will return to this approach in Chapter III after introducing and discussing the current semantic interface used for the Nigel grammar.

2.4.4 Register-specific features outside the general grammar

Up to now I have described the grammar as it is used for recipes as an 'abbreviation' of the general grammar: there are certain options that are not chosen, certain simultaneous options are always chosen together, and so on. However, there are also grammatical strategies that seem to be fairly specific to particular registers and cannot be related to the general grammar as abbreviations. These strategies relate directly to some prominent property of the specific register. I will give a few examples, starting with one characteristic of our grammar of recipes. It comes from the textual metafunction and concerns

the treatment of recoverable information.

There is a special strategy in the recipe grammar for the treatment of information that is recoverable from the preceding text; complements are left implicit, as in the following example (implicit complements marked by underlining):

> In a shallow fire-proof dish make a ring of creamed potato or duchess potato mixture; glaze ___ with a beaten egg and bake ___ in a moderate to hot oven 375-400 °F., M5-6 until browned and warm. Fill ___ with a mixture of vegetable either in a sauce or glazed with melted butter. Garnish ___ with parsley and serve ___ .
> (Highton & Highton, p. 209)

The strategy is different from the choice of goal-intransitive in material transitivity as well as from various forms of ellipsis in the general grammar. The option goal-intransitive is chosen for experiential reasons; the goal is of the general class of participant compatible with the process: *I like to bake, I don't garnish very well.* The strategy is like ellipsis in that it is under textual control, but it is different from ellipsis in that it does not presuppose a particular lexicogrammatical item and can only be used if the information presupposed is specific (identifiable). It is a matter of zero reference (pronominalization) rather than ellipsis.[16] In fact, it may be quite reasonable not to regard the strategy as part of the general grammar of English but rather as a special feature of instructional registers, such as recipes. If we adopt this approach, we must note that the grammar of a specific register is not just an abbreviation of the general

[16] If we supply what is presupposed, it is the meaning of the discourse entity referred to rather than a previous lexicogrammatical form. For instance, we get *in a shallow fire-proof dish make a ring of creamed potato or duchess potato mixture; glaze it with a beaten egg* rather than *in a shallow fire-proof dish make a ring of creamed potato or duchess potato mixture; glaze a ring of creamed potato or duchess potato mixture with a beaten egg.* For the difference betwee reference and ellipsis & substitution, see Halliday & Hasan (1976).

grammar.

Next, consider an example from news reporting. In the general grammar, projecting clauses may precede the clause they project, they may follow it, or they may even be included within it. If the projecting clause follows the projected one, the sequence of constituents may be Process ^ Sayer. This is true also of news reporting, but when the projecting clause precedes, there is a thematic option typical of news articles, which is to thematize the projecting status, i.e. the Process. For example:

> Shevardnadze also renewed the Soviet demand for abandonment of the U.S. Strategic defense Initiative, popularly called Star Wars. Said he: "The Soviet Union is proposing a world without weapons in space." (Time, 4/xi/85)

This thematic strategy is highly motivated in the context of news reporting, where the status of reporting is always at issue. The example illustrates a common use of the strategy, which illustrates the foregrounding of reporting in news reports. Shevardnadze's position is first represented in the reporter's words and it is then followed by an elaboration representing the position in Shevardnadze's own words. The status of the elaboration as a quote is thematized. Similar examples include:

> Ferraro has been unable to learn whether the Justice Department Probe will end before the 1986 Senate campaign, and decided that the uncertainty would be fatal. Said she: "If the investigation was still pending, the issue would be Geraldine Ferraro."

> She plans to add the $1 million she has earned from that venture by joining a law firm, and she says she wants to remain active in public affairs. Said she: "I think I can be of service to my country without being in public office, at least for the time being."

While some Israelis complained that the U.S. was being high-handed in its demands, others rejected the idea advanced in Israel that the Pollard spying mission had been conducted without the knowledge of present or former high-ranking officials. Declared the Jerusalem Post: "One of Israel's top political leaders is obviously responsible for either horrendous judgment ... or political irresponsibility in failing to supervise the extremely sensitive intelligence agency that carried out the spying operation in Washington."

(Time, 23/xii/85)

Casual conversation provides us with a number of examples. I will just point to a well-known one involving THEME and REFERENCE. In a declarative clause, the Theme may be picked up be means of pronominal anaphora (Halliday, 1967: 241):[17]

the sound that came floating out on the air I didn't know I had *it* in me. (recorded example, from Halliday, op cit.)

An' so my red sweater, I haven't see *it* since I got *it*. (from Ochs-Keenan & Schieffelin, 1976: 243)

but then Leverhulme I would have thought that this was right up *their* street (CEC)

(Alternatively, the Theme may be marked by *as for, as to,* etc., but this strategy is much more typical of expository, written English.) We also find this strategy of pronominal anaphora with the structural Theme of a relative clause; for example:

a piece of baggage that you don't mind if *it* gets lost at the air port (casual conversation)

[17] Halliday notes that the strategy is "a favourite in ballad and mock ballad style". Perhaps these represent types of literary text that are close to informal speech in certain respects.

They are some display options there which you don't need to have *them*. (casual conversation)

As already suggested, examples of the kind that have been cited cannot be related to the general grammar as register-specific abbreviations of it, since the examples represent alternatives specific to particular registers (or families of registers). Consequently, we have to address the question of how to deal with examples of this kind in some way. The possibility of writing register-specific grammars is, of course, still open, but this approach has drawbacks, as noted above. However, we can explore the possibility of register-specific modules designed to replace certain regions of the general grammar. (This approach is also relevant to the question of how to deal with register-specific lexis; cf. Section II:4.)

~*~*~*~*~*~

I have considered various questions concerning the characterization of coverage, the needs in text generation in general, and the variation in needs depending on the particular register or registers of the texts to be generated. I will now turn to questions concerning the extension of the grammatical framework. They are often related to coverage: if we want to extend the descriptive coverage of the Nigel grammar, what are the problems we will encounter; how do we have to extend the grammatical representation to increase the descriptive coverage?

[4.3 Recipes and other registers

Martin & Peters (1985) provide a summary of the main grammatical features of narrative and exposition. We can add instruction.

		instruction	narration	exposition
clause	COMPLEXITY	paratactic extension & enhancement hypotactic enh.	paratactic extension & enhancement	paratactic extension & elaboration
clause	TRANSITIVITY	material (relational) extent: duration, manner	material location (time & space)	material (general time) & relational location, cause, manner
clause	MOOD	imperative	declarative	declarative
clause	CONJUNCTION	external: temporal succ.	external: temporal succ.	external & internal; varied
v. group	TENSE	-- ([general] pres.)	[specific] past	[general] present
n. group	TYPE OF THING	concrete	concrete	concrete & abstract; facts; processes [-> nominalization]

]

[2.4.4:...Also: An avid angler, President Pumpernickel came to power in 1998; relative clauses without Subject/Wh, e.g. CEC p. 58]

3. Extensions to the baseline grammar

3.0 Baseline and extensions

In Section II:1, I sketched the current version of the Nigel grammar. I will now take that version as a 'baseline' grammar in relation to which we can consider extensions -- both additions and replacements. The purpose is to make the grammar more resourceful in terms of functionality and coverage. There are a number of representational issues that arise with the current Nigel grammar and these have to be diagnosed and addressed. The emergence of the issues to be discussed is an example of how the task of developing a grammar for text generation brings various aspects of general theory and description into focus. If the issues are treated in a general way, we will address questions in text generation and at the same time we will leave the particular concerns of text generation and deal with general issues.

3.0.1 Diagnosis and treatment

The first step is to diagnose the representational problems in functional terms. I will also try to identify a range of solutions for each problem; it is important to map out the space in which the problems and the various possible solutions can be located. In most cases, I will not argue in favour of one solution or another since the choice of solution will depend on a number of factors which may vary from one context of use to another and from one text generator design to another.

My concern will thus be to map out, as far as possible, the full range of potential solutions, and to treat these as alternatives with different characteristics in terms of usefulness rather than attempting to find a unique alternative, while rejecting all others. Although it may be valued as an indication of progress, rejection as a general strategy is very costly, since it often means that the alternatives rejected are simply dismissed and forgotten and have to be rediscovered when the conditions where they make sense come about. Progress lies in the development of a map of the various approaches to solutions, with indications of how they differ. Since different perspectives, such as different metafunctional perspectives, may suggest different kinds of solutions, I will also try to identify the possibility of adopting more than one perspective, whenever possible.

3.0.2 Diagnosing representational issues

In a systemic grammar, all parts are ultimately interconnected; the grammar is a network of systems of options and each option may have one or more realization statements associated with it, serving to specify a structure fragment or to predetermine the choice of an option as the grammar is re-entered. Given this interconnectedness, we could choose various starting points in a discussion of representational issues, for example the representation of the network of systems or the representation of structure. We could discuss the issues in terms of the grammar as a system at rest (the potential) or of the grammar as a process (the potential actualized). We could choose one of these various angles on lexicogrammar and still hope to arrive at a diagnosis of representational issues that is reasonably general.

For example, Nigel cannot generate complex clause combinations such as

> If these papers come by the twenty-ninth and you send them through to me in Loughton then between the twenty-ninth and let me see we're having this meeting of CSC assistants on the fourth of July, which is a Saturday, I'll have about half a day's work to look at some odd scripts before then and then I shan't get any scripts from the assistants before about let me see four five six seven about the eighth so I shall have roughly from the twenty-ninth of June to the eighth of July, on which I can spend the whole of that time on those papers if they happen to come and then again from the eighth of July until whatever time your council meeting is again.
>
> (CEC, p. 37)

We can get at this problem through structure or through system. Structurally speaking, the problem is that Nigel cannot handle indefinitely expandable interdependency structures, only finite constituency structures. From the point of view of systems, the problem is that Nigel cannot handle systems that can be entered recursively. In this case, the generalization is a metafunctional one; it is that Nigel is not well-equipped to deal with logical grammar, i.e. grammar organized according to the logical metafunction, in its own terms, only as if it were just like experiential grammar (see further Section II:3.2.4).

Each time we meet a problem of the kind illustrated by the clause complex we have to ask where it is located in the grammar from a functional point of view. We may have to increase the generative power of the grammar but what is of central importance is that we upgrade its resources in such a way that it can serve the rest of the text generation system. For example, it is not enough to add iterative schemata to the grammar to handle clause complexes, since this would not provide the grammar with the interdependency type of structure needed for

realization statements (cf. Section II:3.2.4 on interdependency structure). We need to reflect the functional character of the logical metafunction.

3.0.3 Three areas of extension

In this section, I will locate representational issues in relation to the grammar in three ways -- markedness, metafunction, and metaphor:

(i) **Markedness:** the Nigel grammar treats marked cases in the same way as unmarked ones; there is no convention by which the latter can be treated as the default.[1] -- Section II:3.1.

(ii) **Metafunction:** the Nigel grammar operates with constituency structures, but constituency is typical of the experiential metafunction rather than the full spectrum of metafunctions. -- Section II:3.2.

(iii) **Metaphor:** the Nigel grammar specializes in congruent realizations and does not relate them to metaphorical ones. -- Section 3.3.

These angles give us a way of characterizing the Nigel grammar as the baseline in relation to which we can make extensions in terms of markedness, metafunction, and metaphor:

[1] Default ordering (Section II:1.2.2) is an exception. Default ordering statements are used to specify unmarked ordering that obtains if there are no statements to the contrary.

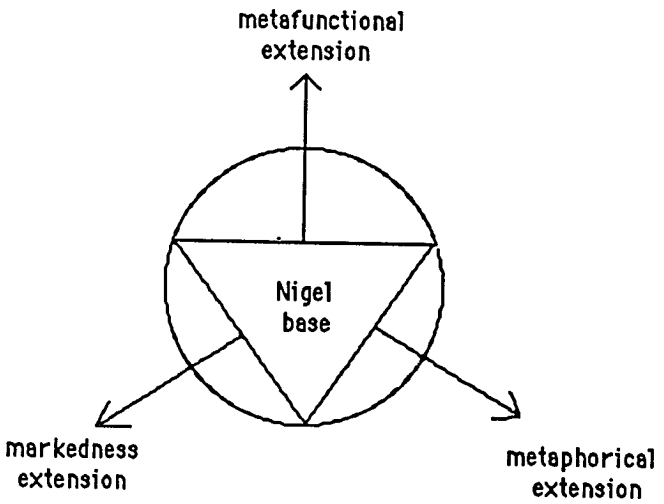


Fig. II:3.0-1: The Nigel grammar in the space of possible extensions

Since it is already quite capable and provides us with a well-defined frame of reference for experiments in extensions, the Nigel base is very valuable in its own right but the target is, of course, to make Nigel a more well-rounded grammar -- to extend the baseline Nigel grammar in all three directions so that it can deal with marking, metaphor, and metafunctions other than the experiential one in their own terms. I will start with markedness in Section II:3.1 and then move onto metafunction (Section II:3.2) and metaphor (Section II:3.3).

3.1 Messes and markedness

3.1.1 Nigel and convention

As the constraints on realization statements presented in Section II:1.2.2 indicate, Nigel is a very literal grammar. If there is a realization statement such as + Subject, it is to be taken at face value: Subject is to be inserted under all circumstances. Similarly, if there is a statement to the effect that Subject is to be conflated with Agent, Subject / Agent, it is intended to be executed under all circumstances and if one function is missing we have a grammar error. In this respect, Nigel differs from e.g. Hudson's (1971) grammar, which contains a number of conventions for the application of rules. Nigel's literalness means that the grammar is very explicit and easy to interpret; for example, conditional presence of a function can always be 'read off' from the system network, e.g. in the form of a gate with a conjunctive entry condition. At the same time, Nigel's literalness leads to certain wiring messes in the grammar; the gate for inserting Subject is a good example; I have already discussed it as an illustration of a gate (Section II:1.2.1.3.3), and I will return to it in this section (Section II:3.1.5).

3.1.2 Types of marking issues

In this section, I will diagnose the following inelegancies in Nigel and propose principled ways of avoiding them:

(i) Paradigmatic gaps and marking conventions: Section II:3.1.3.

(ii) Preselection and unmarked choice: Section II:3.1.4.

(iii) Unmarked presence and marked absence: Section II:3.1.5.

Some issues of markedness involve differences between pairs of metafunctions and will be discussed in terms of the reconciliation of metafunctional perspectives, in Section II:3.2.2.

3.1.3 Paradigmatic gaps and marking conventions in the system network

The system network presented in Section II:1.2.1 only allows for the conditioning of system entry through entry conditions. It does not allow for conditioning of feature selection (except in a subsequent traversal of the network, by means of preselection). In particular, simultaneous systems are completely independent of and unordered with respect to one another. However, systemicists have used a small number of conventions to indicate various restrictions on the selection of feature combinations; the symbols used here are daggers and stars[2] (); see the table below for addition and condition.

[2] Halliday (e.g., 1976) uses paired symbols such as a* ... x*, while Martin uses 'I' (if) and 'T' (then): a^I ... x^T. Cf. also Hudson's feature addition rules in Daughter Dependency Grammar in Hudson (1976).

relation between features	relation between systems	graphic convention	gloss
addition	ordered	a † → b → c * d	if feature 'a', then also feature 'c' ; if 'a' is selected, 'c' is added
condition	unordered	{ a † → b ; c * → d }	if feature 'a', then also feature 'c' ; if 'a' is selected, 'c' is chosen rather than 'd'

Fig. II:3.1-1: Marking conventions

These conventions have not been defined in Nigel. They do not lend themselves to simple formal representation in Nigel, but they can be viewed as shorthand for more explicit wiring in the network of the current version of Nigel.

3.1.3.1 The conditional marking convention

In my discussion I will focus on the conditional marking convention, which is used to relate the choices of two features in different but simultaneous systems -- sister systems.[3] Normally, simultaneous systems generate a full paradigm as do the simultaneous systems of MOOD and POLARITY. However, paradigms may, of course, have gaps and the question is how to deal with these gaps. The

[3] When the system (a / b, in the table) with the conditioning feature (a, in the table) is binary, the two types are inter-translatable. However, they are not if the conditioning system is a three-term one.

conditional marking convention deals with gaps as follows. For two simultaneous systems with the same entry condition, m: a/b and m: c/d, the choice of one feature, say b, always implies the choice of another feature, say d: 'if feature b is chosen, then choose feature d'; in other words, the combination of b and c is the paradigmatic gap. We can state this as b -> d or simply, using the systemic convention, as b† d*. This convention gives us a way of describing a gap in a paradigm:

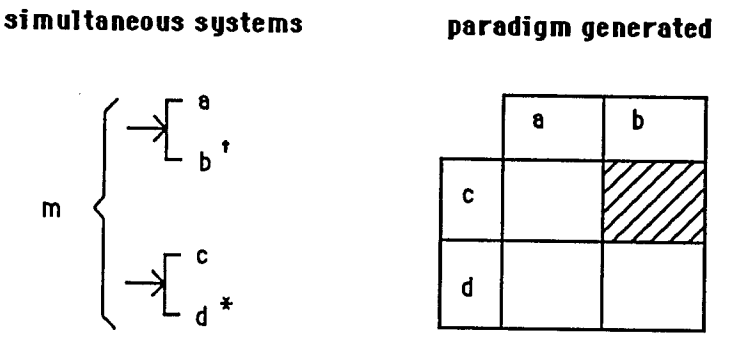


Fig. II:3.1-2: Conditional marking convention and paradigm with gap

As a real example, consider the simultaneous transitivity systems AGENCY and PROCESS TYPE. The paradigm is complete except for one combination that appears to be a gap, viz. effective & verbal; i.e., if a clause is verbal, it also has to be middle (cf. Halliday, 1985: 155):

	middle	effective
material	the door opened	he opened the door
mental	he fears the future	the future scares him
verbal	he said: "..."	
relational	he is mayor	they elected him mayor

Fig. II:3.1-3: Example of paradigmatic gap

Using the conditional marking conventions, we can express this as verbal† middle*, to be read as 'if verbal, then middle'; or in network form:

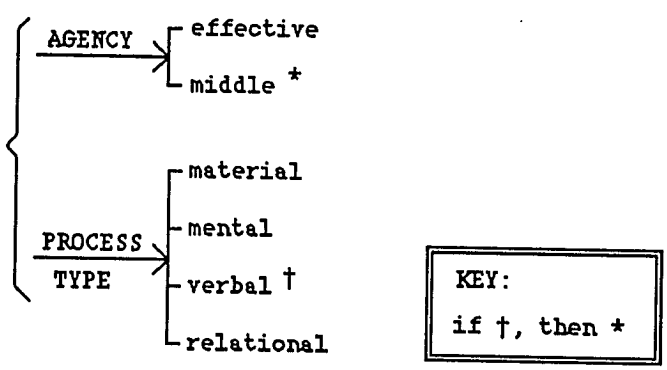


Fig. II:3.1-4: Example of the conditional marking convention

3.1.3.2 The problem with the conditional marking convention

Up to now I have characterized the conditional marking convention in terms of the grammar at rest. The problem with the convention arises when we try to specify an algorithm for traversing the system network (such as the one discussed above in Section II:1.2.1.6); in other words, the question is how the convention is to be interpreted in a dynamic account of actualization. Recall that the entry order of simultaneous systems is arbitrary. It is not too hard to imagine that if the system a / b is entered first and the conditioning feature b is selected, this choice can affect the selection in the subsequent system c / d; similarly in the case of PROCESS TYPE and AGENCY:

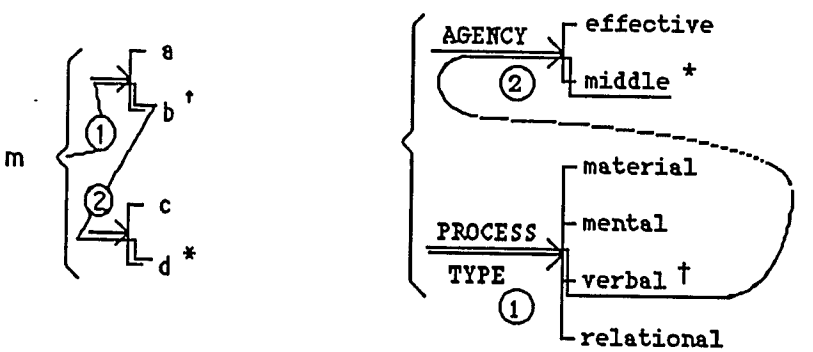


Fig. II:3.1-5: Traversal in which conditioning system is entered first

We might devise the following procedure, stated in terms of the abstract example: if a feature x marked for coselection with another feature y is chosen, then preselect[4] y in the system in which it is one of the terms. The procedure

[4] This preselection is different from the inter-rank preselection presented earlier, since it would

should work if the arbitrarily selected entry order is as indicated in the diagram above; that is, if the system with the conditioning feature is entered first.

However, if the system with the conditioned feature (c / d in the network fragment) is entered first and the non-conditioned feature c is chosen and the conditioning feature b is chosen as the second system is entered, the result is the selection expression {b, c}, which the network was written to rule out. The feature b implies the feature d, but its systemic alternative c has already been selected. In other words, the traversal algorithm arrives at the conditioning feature too late in our example.

(It is perhaps worth mentioning that there is a structural parallel to the problem just discussed. The problem is due to the lack of interaction between simultaneous systems in the system network and simultaneous systems are sisters; dependency in the system network runs from mother to daughter. Similarly, there is no structural interaction between sister constituents in grammatical structure:

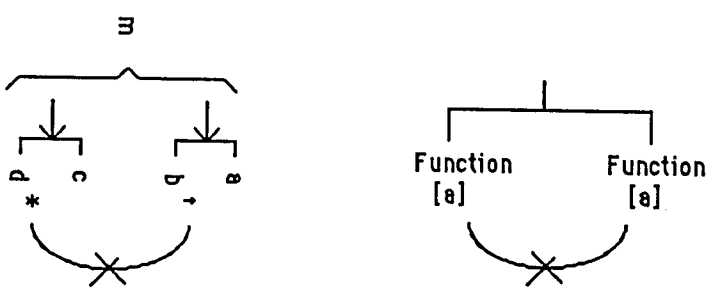


Fig. II:3.1-6: Lack of sister-interaction in paradigm and syntagm

work within one traversal of the system network.

We will meet examples of the latter in Section II:3.2.6.)

3.1.3.3 Solutions to the problem with the convention

There are various classes of solutions to be explored; they are either theoretical or descriptive and work at the grammatical stratum or at the chooser and inquiry stratum:

(i) we can change the grammatical description so that the need to use the marking convention disappears;

(ii) we can accomodate the marking convention at the immediately higher stratum -- the chooser & inquiry interface;

(iii) we can change the implementation of the grammatical theory so that the marking convention can be handled.

I have listed the approaches roughly in the order I would try them in Nigel. Approaches (i) and (ii) are perhaps less clearly ordered, but type (iii) is the last one to be tried, since it involves more work. In general, changing the implementation of the theory is more costly than changing the description, either at the grammatical stratum or the semantic one.[5] Let me exemplify each approach briefly.

[5] This is a practical consideration: changing the implementation will often be more motivated theoretically.

(i) Grammar - descriptive solution

The descriptive solution is to rewire the system network in such a way that it does not generate any paradigmatic gaps and the need to use marking convention disappears. This usually means making the system with the conditioned feature dependent on rather than simultaneous with the system with the conditioning feature by giving it an entry condition, possibly disjunctive, with one of the features of the conditioning system. For example, we can make AGENCY dependent on PROCESS TYPE by changing its entry condition from 'clause' to a disjunction of the features that are freely combinable with middle / effective, i.e., a disjunction of material, mental, and relational:

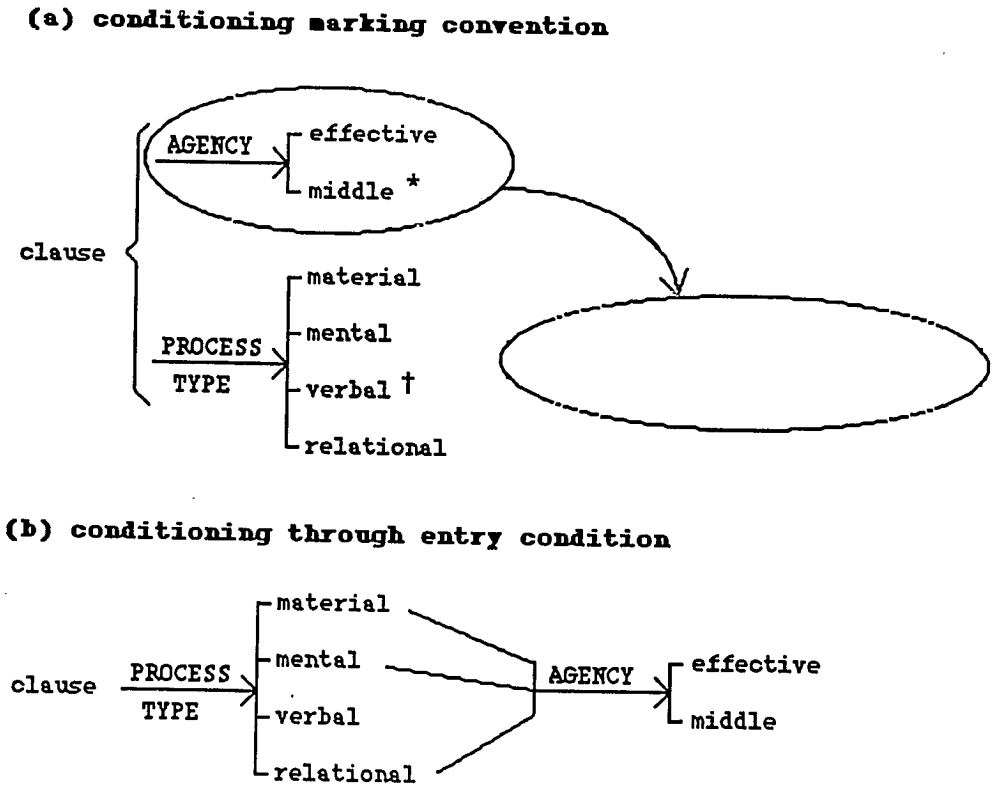


Fig. II:3.1-7: Conditional marking turned into entry condition

The feature 'middle' in version (b) is no longer related to 'verbal' in any way, so the grammar does not state explicitly that verbal clauses are middle and other systems cannot rely on the feature 'middle' to cover verbal clauses as well. To make systems in the grammar of version (a) with 'middle' as (part of) their entry conditions reachable also in the grammer of version (b), we have to give all of them a disjunction of 'middle' and 'verbal' or define a gate that embodies this disjunction in a feature middle´:

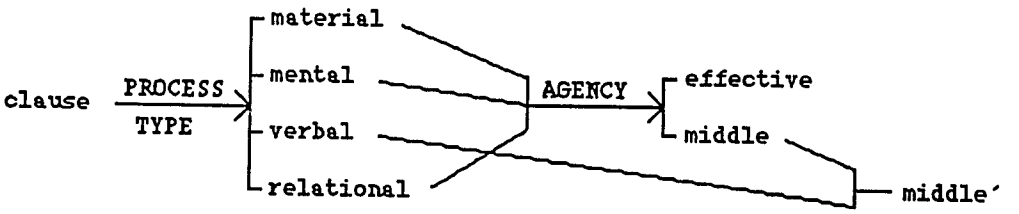


Fig. II:3.1-8: Gate for adding feature

The translated result in version (b) is inelegant in that AGENCY has an entry condition that is a disjunction of three out of the four terms in PROCESS TYPE and in that it necessary to create an additional disjunctive gate. It leads to additional complexity in the system network.[6]

In a descriptive representation of the systemic potential, it is clear what the conditional marking convention means and it is also clear that it constitutes a significant statement about paradigmatic organization. For example, it has long been recognized in European structuralism that paradigm pressure is an important aspect of linguistic change; cf. for example, Martinet (1964) and also Heller & Macris (196).

Furthermore, in a generation grammar, it is valuable to to maintain simultaneous systems in the system network, since simultaneity increases the potential for a parallel generation algorithm (see Section II: 1.2.1.6 above).[7]

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[6] I characterized the result in terms of inelegance because there is no algorithm for ranking and comparing complexity in the system network; compare and contrast Reich's (1968) work on complexity in networks in stratificational models.

[7] The simultaneity lies in system entry, not in feature selection, since the selection is conditioned.

(ii) Semantic solution

In a semantic approach, the choosers of the systems involved in the marking convention are designed to simulate it. This could happen in either of two ways. (1) The chooser of the AGENCY system would ascertain whether the process is a verbal one or not; if it was verbal, the chooser would automatically select the feature middle. (2) Alternatively, the features middle and verbal could be chosen at the same time, but that would require a change in the chooser and inquiry framework. The possibilities will be taken up again in more detail in Chapter III (Sections II:2.3 and III:4.2). The general point is that the same semantic feature leads to the selection of the two grammatical features that are related conditionally. For example, the semantic feature 'symbolic process' would lead to the selection of the grammatical feature middle as well as the feature verbal:

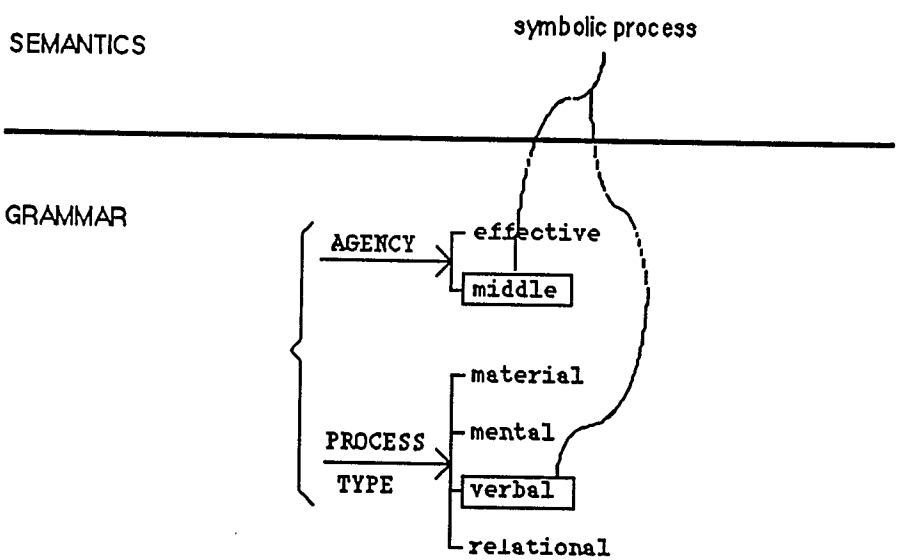

Fig. II:3.1-9: Semantic control from above of 'coselection'

(iii) Grammar - theory solution

Finally, we can change the implementation of the theory so as to reflect the marking conventions.

(a) In the case of a binary conditioning system, there is a particular possibility: the conditioning can be treated on the model of feature addition. That is, we could represent the two systems a / b† and c / d* as a / b & d and c & a / d. This would still require a change in the Nigel framework, since terms in systems can only be single features, not conjunctions of features. There is, however, a direct FUG equivalent to a / b & d and c & a / d, which is represented below.

(i) in systems

$$\left\{ \begin{array}{l} \rightarrow \left[\begin{array}{l} a \\ b \,\&\, d \end{array} \right. \\ \\ \rightarrow \left[\begin{array}{l} c \,\&\, a \\ d \end{array} \right. \end{array} \right.$$

(ii) in FUG description

$$\left[\begin{array}{l} \left\{ \begin{array}{l} [\ X = a\ ] \\ [\ X = b \,\&\, d\ ] \end{array} \right\} \\ \\ \left\{ \begin{array}{l} [\ Y = c \,\&\, a\ ] \\ [\ Y = d\ ] \end{array} \right\} \end{array} \right]$$

Fig. II:3.1-10: Feature conditioning as addition in FUG treatment

This type of solution goes beyond changing the implementation of the theory; it constitutes a change in the theory of systems, since it operates in terms of systems with feature conjunctions serving as terms whereas systems currently have only one feature per term (i.e., output feature is synonymous with term).

(b) Another, more general possibility is to interpret the conditional marking convention 'if x, then p' ('if verbal, then middle') as 'x, only if p' ('verbal only if

middle'), i.e., as a **grammatical choice condition** on a feature.[8] In the system x/y/... (verbal/ mental/ material/ relational), x (verbal) can only be chosen if the feature p (middle) has been chosen. That is, the while the system can be *entered* as soon as its entry condition has been satisfied, the system can only *select* after the system satisfying a choice condition on one of its features has selected. (Recall that system entry and feature selection are separate steps in the network traversal: Section II:1.2.1.6) Consequently, it would be a grammatical error to write a grammar where the system x/y/... can be entered under conditions when the system p/q/... cannot be entered.

A possible diagrammatic convention for drawing a choice condition is given below.

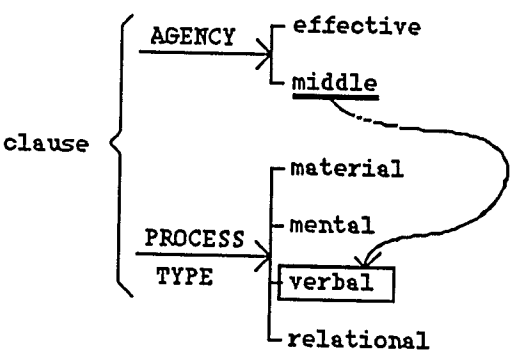

Fig. II:3.1-11: Diagrammatic representation of grammatical choice condition

If we add a grammatical choice condition of this kind to the framework, it would have the following kinds of paradigmatic conditionings.[9]

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[8] Compare the use of enabling nodes in networks in stratificational models. Grammatical choice conditions are distinct from semantic choice conditions: see below.

[9] All conditionings are paradigmatic; there are no syntagmatic conditionings.

stratum		system entry	feature selection
grammar:	intrarank	entry condition	choice condition
	interrank	---	preselection
semantics:		---	choice condition [= inquiry response(s)]

Fig. II:3.1-12: Types of paradigmatic conditioning

The semantic choice condition is an interstratal kind of conditioning -- interstratal preselection and will be discussed in Chapter III. The interrank kind of conditioning is preselection and is achieved by the Preselect operator in Nigel (Section II: 1.2.2.6). I will discuss it briefly now.

3.1.4 Preselection and unmarked choice

The Nigel Preselect operator is a forceful one. If a feature has been preselected, the actual selection of this feature is ensured by path augmentation, which means that the feature path in the system network that leads to the entry condition of the system from which the feature has been preselected is also selected: see Section II:1.2.2.6.3. Consequently, the effect of the Preselect operator is not local to the system whose feature has been preselected. Most of the time the path augmentation is exactly what is needed. However, there are cases where a local variant of the Nigel Preselect operator

would be useful.

So I propose a variant of Preselect, call it PreselectLocal, that does not lead to path augmentation and can be interpreted as *potential* preselection: given a preselection of feature x in the system x / y, select feature x if the entry condition of system x / y is satisfied, but do not force the system to be entered by path augmentation.

Grammatical case may serve as a simple example. Assume we preselect Subject to be nominative, Subject: nominative -- i.e. (Preselect Subject nominative). Since only certain pronouns select for case in the nominal group, the path-augmenting preselect statement Subject: nominative would have the effect of forcing all Subjects to be pronominal, which is not the effect we want. However, if PreselectLocal is used -- (PreselectLocal Subject nominative), we will get the result desired: if the pronominal case system is entered, the feature nominative will be selected. If, on the other hand, Subject is realized by a clause or a non-pronominal nominal group, the pronominal case system is not entered and the preselection does not take effect.

What would the division of labour between Preselect and PreselectLocal be in a grammar using both? Preselect would be used for preselections of features within the parts of the system network devoted to clauses, groups / phrases, and words other than case, number, and person. PreselectLocal would be used for preselections of features of case, number, and person at word rank and any group rank selections anticipating these. Case (nominative / oblique), number (singular / plural), and person (first / second / third) are all 'inflectional systems' explicitly specified for only a subset for the words of the classes they are

applicable to.[10] For example, among nouns only certain pronouns show the case distinction between nominative and oblique and while most verbs show number distinctions all do not. The different uses of the two preselection operators are summarised below.

	PreselectLocal	Preselect
clause		✓
group/ phrase		✓
word	case, number, person	[other]

Fig. II:3.1-13: PreselectLocal and Preselect

3.1.5 Unmarked presence and marked absence (structure)

So far I have focused on issues having to do with the conditioning of the selection of a feature, within one traversal of the system network as well as between traversals. The latter depends on the use of the preselection operator and I suggested that we might want to consider adding a new version of the operator, viz. PreselectLocal. PreselectLocal allows us to state *potential* preselections of features, i.e., preselections that may not take effect, since any given preselection will only be an actual one in the appropriate environment. If

[10] Another strategy might thus be to give inflectional systems some special status so that preselections of their features would not result in path augmentation.

the system affected by the preselection is entered, the preselection becomes actual; otherwise, it remains potential and nonactual.

The distinction between potential and actual can also be used in combination with another type of realization operator, viz. insertion. The realization operator Insert determins the presence of a function in one layer of a structure (Section II:1.2.2.4). Once a function has been inserted, it is actually present in the structure; present means 'actually present' rather than 'potentially present' or 'present in the default case'. This constraint on the meaning of presence in the structure is desirable most of the time, but there are contexts where it leads to complications in the grammar.

Let us consider the question of how we deal with implicit functions, e.g. implicit Subjects. Subject is explicit, actually present, in almost all indicative clauses. Consequently, it is tempting to associate the realization statement +Subject with the feature indicative. If we do (as in system MOOD TYPE of the sample grammar in Section II:1.2.1.5.1), we will get Subjects even where we do not want them, where they are implicit, as in *Haven't had dinner yet* alternating with the explicit *I Haven't had dinner yet.* We can avoid this situation, (i) descriptively, by adding further conditions to the paradigmatic context in which the actual realization statement +Subject appears, which is the current solution in Nigel, or by changing the framework, e.g. (ii) by introducing the capability of negating features; or (iii) by introducing a distinction between potential and actual presence. I will briefly discuss each of these.

(i) Conditioning the actual realization statement

We can adopt a descriptive approach to the problem of the omnipresence of subjects in indicative clauses. The normal strategy in a systemic grammar is, of course, to increase the delicacy of the paradigmatic context in which a realization statement appears. There is no formal difficulty in adding to the conditions under which the statement +Subject is applied so that Subject does not get inserted where it should be left implicit, but the added conditions do complicate the grammar a bit. Let's assume we want to say that all indicative clauses have a Subject unless they are declarative and have a speaker subject and have selected the feature 'implicit' instead of 'explicit'. This grammar gives us the alternation implicit *Haven't had dinner yet* ~ explicit *I Haven't had dinner yet.*[11] We can start with a specification that inserts Subject in all indicative clauses:

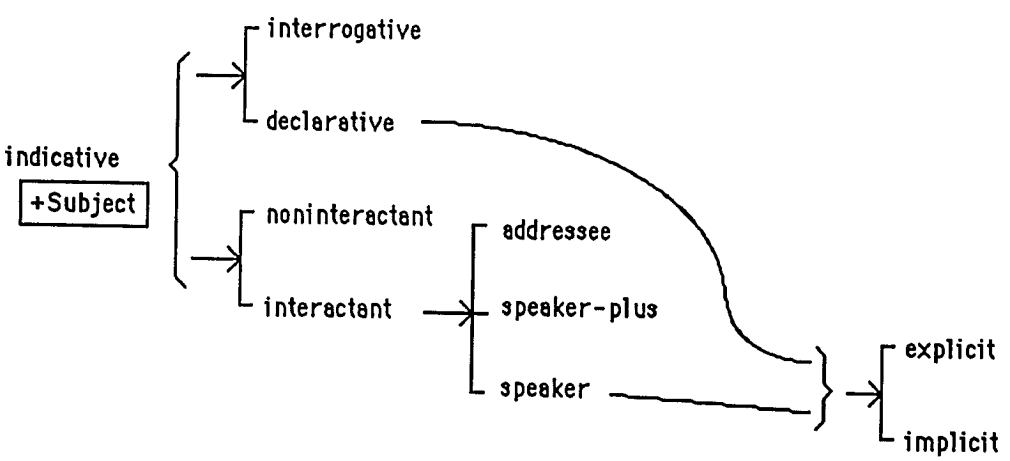


Fig. II:3.1-14: Insertion of Subject in all indicative clauses

[11] I have chosen not to include the option of having an implicit mood in clauses that are yes/no-interrogative & addressee (subject) for the purposes of the illustration: *[Have you] seen any good movies lately?*

This has the effect of inserting Subject in 'implicit' clauses. To avoid this, we can move the insertion statement to all terminal features with the exception of 'implicit':

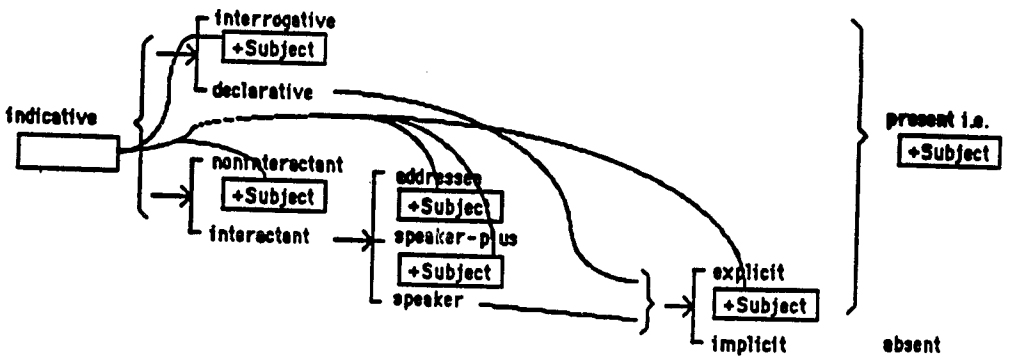


Fig. II:3.1-15: Moving insertion statement to more delicate feature contexts

Moving the insertion statement to a number of more delicate feature contexts gives the right result. The grammar captures the distinction between the presence and absence of Subject. The notion of presence or explicit subject is distributed across a number of different features -- terminal indicative features other than 'implicit'. These different features can be wired together in the disjunctive entry condition of a gate whose output is simply one feature, explicit subject, with which the realization statement +Subject is associated (cf. Section II:1.2.1.3.3). This is illustrated for the sample grammar in the diagram below. (The grouping of the features of the entry condition is presentational and is not formally significant.)

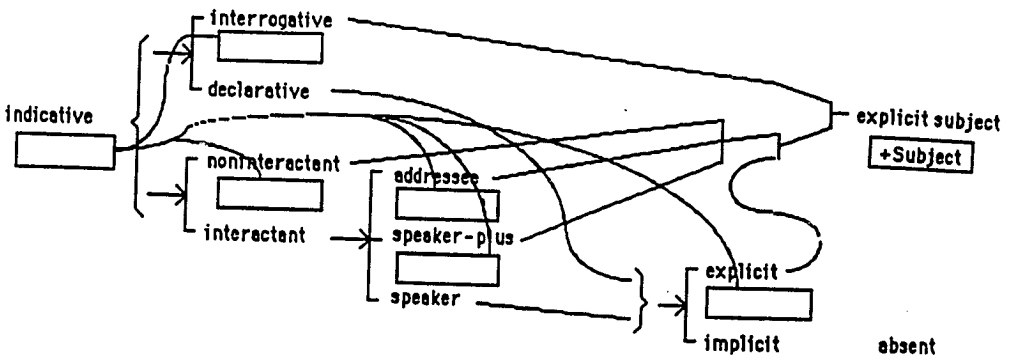


Fig. II:3.1-16: Gate for inserting Subject

The problem with this approach is that the disjunctive entry condition is a collection of all the features other than the feature 'implicit' (in the system DECLARATIVE SUBJECT PRESUMPTION) and it seems counter-intuitive to pick out all the features except for the 'offending' one, the marked case leading to an absent Subject. The complication is increased when we add the conditionality for the generalized transitivity functions Agent and Medium and process-type specific ones Actor, Senser, etc. that may get conflated with Subject:

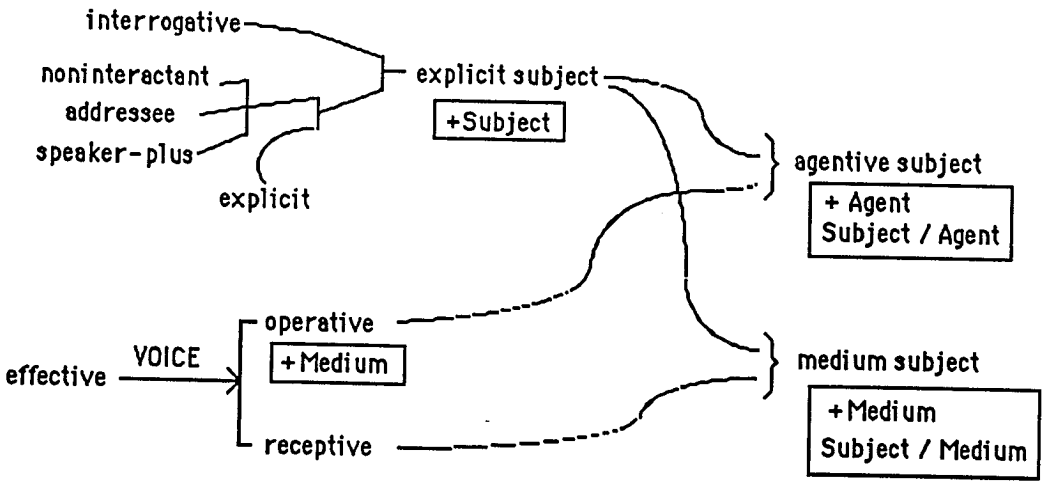


Fig. II:3.1-17: Conditional insertion of Agent and Medium

The transitivity functions Agent and Medium are thus subject to a kind of double conditioning from the transivity feature effective (in the experiential part of the clause network) as well as from the features determining the presence of Subject (in the interpersonal part of the clause network); see Section II: 3.2.2.1 below for further discussion of conditioning from different metafunctions.

(ii) Negating 'exception' features

I suggested that it seems counter-intuitive to collect all the features in a disjunctive entry condition to a gate representing the unmarked case of a present subject when it is the choice of 'implicit' that represents the exception. That is, the gate only represents the generalization that Subject is present *unless* the feature 'implicit' is selected in an indirect way by enumerating all the positive cases. A possible alternative to the approach of using a disjunctive entry condition identifying all the positive cases is to introduce feature negation

into the framework (symbolized by '¬'). This would allow us to control the presence of e.g. Subject as follows.

(a) implicit

(b) ¬ implicit ↘ + Subject

If the feature 'implicit' is selected, no realization takes place. If, on the other hand, it is not selected, Subject is inserted.

Negating features would certainly work and the strategy has already been used by e.g. Fawcett (1980) and, outside of systemic linguistics, in generative phonology. There are two related problems, however.

(a) One is perhaps mainly a problem from the grammar writer's point of view: once somebody has added a negative statement to the grammar, such as ¬ implicit, it is no longer clear what its more cumbersomely stated positive counterpart is. For example, various MOOD and SUBJECT PERSON selections in the grammar will satisfy ¬ implicit positively; more specifically, all the terminal features in the system network in Figure II:3.1-14 above with the exception of the feature 'implicit'. But all TRANSITIVITY selections are simply irrelevant. The lack of the positive information might conceivably cause problems when the grammar is revised.

(b) The other problem has to do with the delay in realization that the statement "¬ implicit ↘ +Subject" will cause. Proof of nonexistence is always hard and the only way to make sure that the feature 'implicit' has not been chosen is to wait

until the feature 'explicit' has been selected or until it can be determined that the entry condition of the system explicit / implicit cannot be satisfied so that the feature 'implicit' cannot be selected.[12] Although this does not mean that the strategy of negating features will not work, it suggests that other strategies should also be explored. I will turn to one alternative now.

(iii) Distinguishing between potential and actual presence

Another way of dealing with the problem of implicit functions involves a re-interpretation of the Insert operator. Instead of defining it as 'actually present', we can define it as 'potentially present', i.e. 'present in the *default* case, unless the function is declared not to be present'. We can then add a preventive operator, call it 'Withhold' abbreviated as *, to be used to specify absence.[13] Assume that Subject has been inserted, + Subject (MOOD TYPE: indicative). If the grammar states *Subject, the Subject, although potentially present, is not actually present (system DECLARATIVE SUBJECT PRESUMPTION: implicit). There would be two possible cases if a function has been inserted:

[12] Alternatively, the generation algorithm might postpone the realization of negative features even longer, until the traversal of the system network has been completed, so that the absence of the negated feature could be checked against the complete selection expression.

[13] The implementation of the prevention operator should be straightforward as long as the generation algorithm works as specified in Section II:1.2.1.6: the grammar is only re-entered to develop the constituents of a unit after the traversal of the system network has been completed. If the grammar were re-entered in parallel with the traversal of the system network, a function might start to be developed but later withheld.

first statement potential presence	possible second statement	resulting structure
indicative ↘ +Subject (potentially present)	implicit ↘ *Subject (withhold)	--- (not actually pres.)
	---	Subject (actually present, by default)

Fig. II:3.1-18: Potential and actual presence

Potential presence can be compared with presence of a function in Fawcett's starting structure (described in Fawcett, 1980). One difference is that Fawcett's starting structure is unconditional, stated for a certain type of unit in general, whereas realization statements of potential presence would be given in some specific paradigmatic context such as 'indicative'. That means that the grammar would operate with two kinds of defaults, viz. unconditional or global defaults, stated as being valid for the whole grammar and conditional or local defaults, stated as being valid locally for a particular paradigmatic context (the condition under which the default may apply). Furthermore, default statements would apply to either ordering (default ordering, Section II: 1.2.2.4.2.3) or insertion:

	ordering	insertion
global, unconditional	Default ordering, e.g. (Process Manner Locative)	
local, conditional		Default presence, e.g. indicative +Subject

Fig. II:3.1-19: Types of default statements

~*~*~*~

As we have seen, there are a number of representational issues that have to do with the representation of marked cases without complicating the representation of unmarked cases. I will now turn to representational issues that relate to the metafunctional differentiation of modes of grammatical organization. These are often harder to represent in the current Nigel grammar than the issues discussed so far.

3.2 Metafunction and modes of grammatical organization

In this section, I shall diagnose representational issues in terms of the metafunctions. I shall unravel the grammar by means of the various realization operators used in Nigel -- conflate, insert, order, expand, and preselect. They serve to specify the structural output of the grammar; the representational issues will consequently be exemplified first in terms of the specification of structure. There are various reasons for starting with the realization operators. One is that they have been discussed and explored less than the system network representation. Another is that they are more restricted in representational applicability than the system network representation (as we will see) and will serve to identify representational issues more clearly.

3.2.1 Accommodating metafunctions in structure

When there are simultaneous metafunctional contributions, there are two extreme principles of structuring that might apply:

(i) the metafunctions generate only one structure; that is, although there are three metafunctions, they generate only a single structure;

(ii) the three metafunctions generate three completely independent metafunctional 'channels'.

Either situation would be free of conflict since there would be no need to integrate and reconcile different structures with one another. The real situation is somewhere in between; it is, in a sense, a compromise. But both extremes, stated as (i) and (ii) above, still embody important parts of the picture; they relate to (i) and (ii) respectively below:

(i) the simultaneous metafunctions generate only one syntagm -- only one sequence of classes, e.g. adv. gp. fl n.gp. fl v.gp. fl n.gp. fl adv. gp. for (adv. gp.) *however,* (n.gp.) *I* (v.gp) *gave up,* (adv. gp.) *unfortunately*;

(ii) the simultaneous metafunctions tend to generate different modes of syntagmatic organization: prosodic (interpersonal), constituency (experiential), and pulsating (textual) -- Halliday (1979); see further below.

These separate modes of organization can be seen most clearly if we look at spoken English, since it has in a sense two different simultaneous 'channels', the clause and the information unit. (The information unit is characterized by a structuring of information into Given and New; it is realized phonologically by the tone group, in which the focus of the New is marked by tonic prominence. Examples will be given below.) Since the information unit does not equal the clause or any other of the units of the rank scale the clause belongs to (groups, words, or morphemes), we can posit another rank scale whose only rank is the information unit. That is, the clause and the information unit come from two simultaneous grammatical rank scales, viz. (i) clause - group/phrase - word - morpheme; and (ii) information unit. The first scale is the same as in the grammar of written language. The second is specific to speech.[1] It has only

[1] Alternatively, we could say that the information unit stands outside the grammatical rank scale. This view brings out the experiential basis of the rank scale, with the other metafunctions standing outside it in various ways (cf. Section II:2.2). The rank scale is motivated by constituency -- clauses

one rank, the information unit, which is 'taken over' from phonology: the information unit is realized by and corresponds to the extent of the tone group (or tone unit), the highest unit of the phonological rank scale:

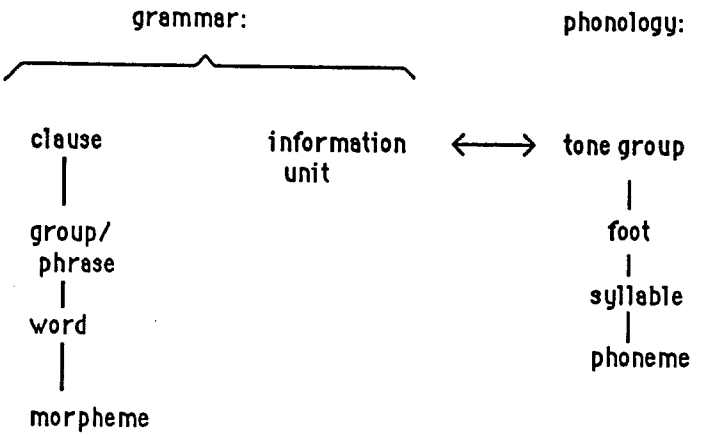


Fig. II:3.2-1: Clause and information unit

The clause[2] and the information unit are co-extensive in the unmarked case; but only in the unmarked case. An information unit can span more than one clause or less than one clause. Examples from Halliday (1967) below:

consist of groups, and so on -- and, as we will see, constituency is the experiential mode of organization.

[2] More specifically, the non-rankshifted clause serving as a clause rather than a rankshifted clause serving as a group or word.

unmarked

but the candidates don't get nine grades

clause
information unit

marked

(i)

this wouldn't count against you when you did your math papers

clause	clause
information unit	

(ii)

but in America they they layer things

clause	
information unit	info. unit

Fig. II:3.2-2: Examples of clause and information unit

(Each information unit is realized by a tone group, so it can be identified phonologically.) This independence of the two rank scales and of clause and information unit is very important in understanding and analyzing representational problems, particularly in the area of the textual metafunction (Section II:3.2.6).

The information unit is the origin of two sets of systems; one is interpersonal, viz. KEY, and the other is textual, viz. INFORMATION (Halliday, 1967). Both are realized by intonation in the tone group, but by different aspects of it. KEY is the speaker's assignment of certainty with respect to polarity, uncertainty, or some more specific subvariety to the information unit as a whole. It is realized by the direction of the pitch movement of the tone group; the basic contrast is between falling pitch ('certain') and rising pitch ('uncertain'). For example, *Have you made the reservations* said with a rising tone reflects uncertainty concerning the polarity, whereas *I've made the reservations* said with a falling tone reflects

certainty.[3] But in addition to falling and rising, there are many further distinctions. Just as the key applies to the information as a whole, the pitch movement -- intonation contour -- characterizes the whole tone group: in other words, it is prosodic.

In contrast, the textual resource of INFORMATION is focal rather than prosodic: it is the resource for giving some element prominence as 'news'.[4] This prominence is realized by the location of the major (i.e., most prominent) pitch movement (irrespective of its direction). It uses intonation as a pulse, with peaks of prominence. For instance, the following clause corresponds to two information units with pieces of information as newsworthy, realized by intonational prominence (two successive falling tones):

```
// that's a crude and // and inaccurate way of putting
it //
```

(CEC, 451)

Now, if we take these two different resources with the information unit as their origin, interpersonal KEY and textual INFORMATION, and the experiential resource of TRANSITIVITY, which has the clause as its origin, we can draw the following hypothetical, simplified picture of English. There are three metafunctional layers, each with its own mode of expression:

---

[3] In contrast to yes/no interrogative clauses, Interrogative clauses of the wh- subtype are said with falling tone in the unmarked case: like declarative clauses, they are certain with respect to polarity.

[4] Although the left boundary is indeterminate in the case of unmarked news; cf. further Section II:3.2.6.

interpersonal (information unit): KEY -- realized by a pitch prosody

experiential (clause): TRANSITIVITY -- realized by constituency

textual (information unit): INFORMATION -- realized by pitch prominence

According to this picture, the three metafunctions are very clearly differentiated in their mode of expression. The main simplification in the picture is that it leaves out the interpersonal and textual components of the clause, e.g. MOOD (interpersonal) and THEME (textual). But we can interpret the more complicated model that includes the interpersonal and textual components by referring to the simplified one: while it can be represented in terms of constituency up to a point, the interpersonal organization of the clause is like that of the information unit; it is like a prosody. Similarly, while it can be modelled in terms of constituency up to a point, the textual organization of the clause is like that of the information unit; it is like a pulse. This gives us the essential insight into why there are representational problems with constituency within the interpersonal and textual components of the clause. I will deal with these in Sections II:3.2.5 and II:.3.2.6. In the meantime, let me summarize the tendencies in metafunctional modes of expression.

	clause		information unit	
interpersonal	MOOD	↖—→ ↘	KEY	prosody
experiential	TRANSITIVITY	constituency	---	---
textual	THEME	↗ ∠—→	INFORMATION	pulse

Fig. II:3.2-3: Modes of expression in clause and information unit

~*~*~*~

The middle way between the two extremes is the integration of of the metafunctions into one complex structure. The two extremes and the middle way are diagrammed below.

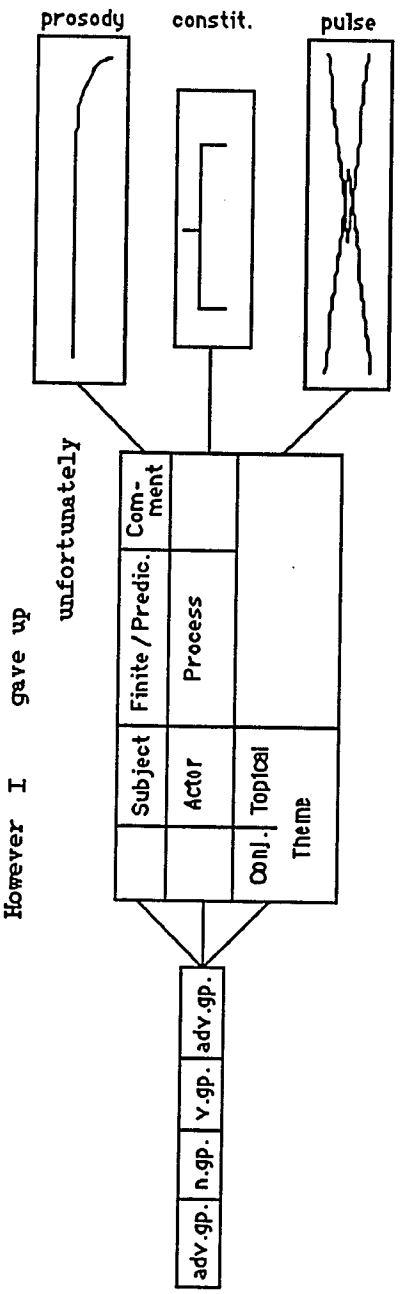


Fig. II:3.2-4: Simultaneous metafunctions

For this picture, it is clear that there can be two metafunctional reasons why representational problems arise, viz.:

(i) *integration:* the metafunctional contributions have to be reconciled and integrated into one complex structure; and

(ii) *mode of organization:* the different metafunctions tend towards different modes of syntagmatic organization whereas Nigel is designed for only one mode, the experiential one.

I will examine the first factor first -- problems of integration -- in Section II:3.2.2 and will then turn to modes of organization in Section II:3.2.3. Before we embark, let me just comment on the relation between the box diagrams used to present structure and the Nigel realization statements.

Box diagrams and realization statements. The box diagram is like a tree diagram in that it represents a product rather than a process, the product of a structure specification (realization statement), but it is used instead of the tree diagram because it facilitates the representation of layering (see the middle box of Figure II:3.2-4 above).

Nigel does not produce box diagrams, but they correspond largely to the structural relations that can be specified by the Nigel realization operators and they serve an important presentational role. However, box diagrams have more representational power than the Nigel realization operators and there are various structural relationships that do not pose a problem for the informal box diagram representation but prove to be a problem for explicit realization

statements (e.g. differences in constituency between metafunctional layers and discontinuity, which I will discuss below).

3.2.2 Metafunctional integration

Problems of integration may arise when functions from different metafunctional layers are *conflated* if these functions disagree with respect to presence, constituency, or realization class. For example, if the interpersonal function Subject and the experiential function Agent are conflated but Subject turns out to be absent there is a conflict. If we wanted to conflate the experiential function Process with the interpersonal functions Finite and Predicator to capture the difference in experiential and interpersonal constituency, this would not be possible in the baseline grammar, since conflation only works with pairs of simple functions. Similarly, if the interpersonal Subject with a preselection of nominal group, the default realization of subjects, was conflated with the experiential Token with a preselection of adverbial group in a circumstantial relational clause (as in *Now* [Subject/Token] *is the time to act*), there would be a conflict. These three types of integration problems for conflation are diagrammed below:

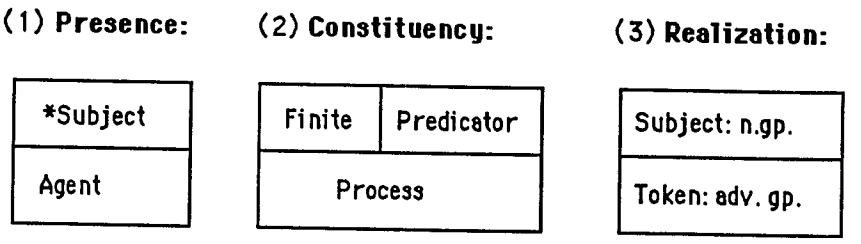


Fig. II:3.2-5: Three integration problems for conflation

I will look at these three problems in some more detail now in Sections II:3.2.2.1 through II:3.2.2.3.

3.2.2.1 Presence and absence in different layers

We saw in Section II:3.1 that the constraint of the interpretation of 'present' to mean 'actually present' leads to complicated statements in the grammar when we account for marked cases. I used Subject as an example. It belongs to the interpersonal layer of structuring in the clause. In our examination of the integration of metafunctional layers, we can now go on to ask what happens if a function that has been inserted, say Agent, gets conflated with a function that has not been inserted, say Subject?

Conflation means actual conflation; both functions being conflated have to be inserted at some point during the pass through the grammar in which the conflation is executed. So in the statement Subject / Agent, both functions have to be inserted. If Subject gets inserted after the conflation, there is no problem. As long as both functions in a conflation statement get inserted at some point, the conflation is valid. However, if one of the two functions does not get inserted, this is considered a grammatical error. This is quite reasonable in most cases, but we have to consider how the constraint affects implicit functions, the problem introduced above in Section II:3.1.

Assume that the transitivity of a clause is such that the function Agent gets inserted (system AGENTIVITY: agentive in the grammar fragment above).

Assume further that the clause is operative ("active"; the VOICE system), resulting in a conflation of Agent and Subject: Agent/Subject. Now, if mood choices lead to an explicit Subject, there is no problem: Subject will be inserted as was Agent. But if mood choices lead to an implicit Subject (system DECLARATIVE SUBJECT PRESUMPTION: implicit), there is a problem: Agent is inserted but Subject is declared to be implicit and hence absent (stated as *Subject in Section II:3.1.5 (iii) above), resulting in a conflation between an inserted function and an absent function. How can the presence of Agent be blocked?

Solutions. We can either (i) solve the problem descriptively by stating the conditionality of the conflation explicitly and systemically or (ii) change the framework of representation by formulating a convention to take care of it.

(i) Change description: increase of conditionality. The first solution is simply to add conditions for the insertion of Agent so that the function does not get inserted unless Subject is explicit in an operative clause. This approach is used in Nigel and poses no formal problems. There is a gate, a "system" with only one output feature, for inserting Agent with a complex entry condition (a conjunction of agentive and explicit subject, given the sample grammar and the gate for inserting Subject). The complexity of the entry condition is a drawback, of course. It would come up for each function that may be conflated with Subject.

(ii) Change framework: potential vs. actual. The other solution is to rely on the distinction between potential presence and actual presence discussed in Section II:3.1. When the statement +Agent is executed, the function Agent

becomes potentially present. If it gets conflated with another function, Subject, that has been inserted as potentially present, both functions will be actually present unless there is a statement to the contrary. There could be a preventive statement, specifying the absence of Subject: *Subject, which would cause the conflation Agent/*Subject to be absent (implicit) as a whole.[5] For example (with Medium / Subject):

'I'	Haven't	seen	the new proposal
*Subject	Finite	Predicator	Complement
Medium	Process		Range

Fig. II:3.2-6: Constituent without interpersonal 'go-ahead'

These conventions are not ad hoc, but functionally motivated: the presence of an element of structure or a bundle of functions depends on more than one metafunction; it is a layered object and unless all the layers are present, the object itself won't be present.

Let me now turn from metafunctional difference with respect to presence to differences in constituency.

[5] Or alternatively, Subject may never get inserted, in which case a convention would prevent the potential presence of Agent from becoming actual presence.

3.2.2.2 Constituency differences between layers

The constituency structurings from two different metafunctional layers typically agree. Experiential participants and circumstances correspond to interpersonal Subject, complements, and adjuncts and the textual theme or themes are selected from these. This is why the constraint on conflation which says that the functions conflated have to describe the same constituent usually works.

However, there is one central case where one-to-one constituency maintained by conflation does not hold, viz. a clause where Finite and Predicator are different interpersonal constituents. From a descriptive point of view, they both correspond to the experiential Process. Interpersonally, there are thus two constituents while experientially there is only one:

You'	*re*	*staying*	*in here*	*are*	*you*	
Mood		Residue		Moodtag		MOOD
Subject	Finite	Predicator	Adjunct	TFinite	TSubject	
Medium	Process		Locative			TRANSITIVITY

Fig. II:3.2-7: Finite & Predicator / Process

The current way around the problem in the Nigel grammar is not to represent the relationship of Finite and Predicator to Process. In other words, there is no theoretical solution but a descriptive 'accommodation' to the constraints imposed by the current representation of the theory. We would need something

like Process / (Finite & Predicator), i.e. conflation with a conjunction of functions -- see Section II:3.2.6.

Another less common and more complex example comes from Halliday's analysis of processes realized by phrasal verbs. For example, *will break off* is one experiential constituent, the Process, which corresponds to three interpersonal constituents, Finite, Predicator, and Adjunct:

he	*will*	*break*	*it*	*off*	
Mood		Residue			
Subject	Finite	Predicator	Complement	Adjunct	MOOD
Actor	Process		Goal		TRANSITIVITY

Fig. II:3.2-8: Phrasal verb in TRANSITIVITY and MOOD

I will return to this kind of analysis below in Section II:3.2.6. In the meantime, I will turn to the third type of conflict between metafunctional layers identified above.

3.2.2.3 Realization differences between layers

When two functions (from different metafunctional layers) are conflated and they carry conflicting realization specifications, a problem of metafunctional integration arises. For example, if Subject: nominal group is conflated with

Token: adverbial group, the result is Subject / Token and a conflict between 'nominal group' and 'adverbial group'.

The general principle of realizing the functionally defined constituents of clause structure can be stated in terms of the interpersonal set of clause functions as follows:

interpersonal function:	realization (unmarked, default):
Subject, Complement:	nominal group
Adjunct:	adverbial group, prepositional phrase
Finite & Predicator:	verbal group

These are the default, unmarked realizations. However, the experiential metafunction may specify marked realizations. Transitivity and circumstantial selections may introduce other, conflicting preselections stated in terms of transitivity functions such as Phenomenon, Token, and Extent that conflate with functions from the interpersonal set. Consider the interaction between Subject and Token in *Now is the time to act:*

Now	is the time to act
Subject: n.gp./	
Token: adv. gp.	

By interpersonal default, the subject is realized as a nominal group: from an interpersonal point of view, the subject is unremarkable and there is nothing to warrant a different specification of the realization of Subject. In contrast, from an experiential point of view, the clause is a special case, viz. a circumstantial identifying relational clause, and the transitivity function Token is constrained to be realized by an adverbial group. Similar examples involving prepositional phrases include *by car is the only way, behind the old barn is where it's parked,* and *after the meeting is the best opportunity.*

There are, then, certain experiential clause functions, participants and circumstances, that may be constrained to be realized by classes other than the default ones specified for the interpersonal set of functions. Some further examples are tabulated below.

Interpersonal function	Experiential function	specific feature	
Subject: n.gp.	Token: adv. gp., p. phr.	circumstantial identifying	Now is the time to act By car is the best way
	Token: clause	metaphenomenal identifying	To be or not to be is the question
	Phenomenon: clause	metaphenomenal	That he quit pleased me
Complement: n.gp.	Phenomenon: clause	metaphenomenal	He regretted that he'd quit
Adjunct: adv. gp., prep.phr.	Extent (dist): nom. gp.		She ran five miles
	Extent (dur): nom. gp.	[if rhematic & ...] relational process time measure: all	She lived there (for) a year She worked all day
	Locative: nom. gp.	deictic time	Let's meet next Monday
	Manner: nom. gp.		She writes the same way Travel Greyhound

Fig. II:3.2-9: Examples of marked realizations

How can conflicts such as Subject: nominal group / Token: adverbial group be resolved? As before, we can (i) change the description or (ii) change the framework of representation.

(i) Change in description: increase conditionality. We can dispense with the generalizations represented by Subject: nominal group, Complement: nominal group, etc. and only state preselections in the more specific contexts where there are no exceptions. While this approach works, it entails a loss in generalization.

(ii) Change in framework of representation: allow default preselections to be suspended. We can also change the framework of representation by allowing default preselections such as Subject: nominal group to be suspended when the function carrying the default preselection is conflated with another function with a marked, nondefault preselection.

3.2.3 Metafunction and structure type

Having discussed issues concerned with metafunctional integration briefly, I will now turn to the different modes of structure associated with the different metafunctions.

3.2.3.1 Two types of variation in structure type

It is widely recognized that conceptions of grammatical structure types vary, but it is also important to note that there are two types of variation in the metalanguage of linguistics, viz. what we might call, borrowing from the framework for talking about language, (i) dialectal and (ii) diatypic (cf. Section I:1.2 (iii)). While it is the first type that has received most attention in the past

thirty years or so, it is the second type that is relevant here.

(i) Dialectal variation in structure type. Two conceptions of structure have been contrasted and received particular attention in the last twenty years or so. One is the traditional conception of structure as constituency and the other is dependency following Tesnière's (1959) work. Although there have been attempts incorporate both conceptions into one theory (notably by Robinson, 1967, and Hudson, 1976), these two conceptions have typically been competing alternatives: one is either a dependency grammarian or a constituency grammarian. To the extent that this is the case, constituency and dependency belong to different metalanguages or metadialects and the variation between them is dialectal: they are essentially different ways of talking about the same thing. For example, they represent clause structure in different ways:

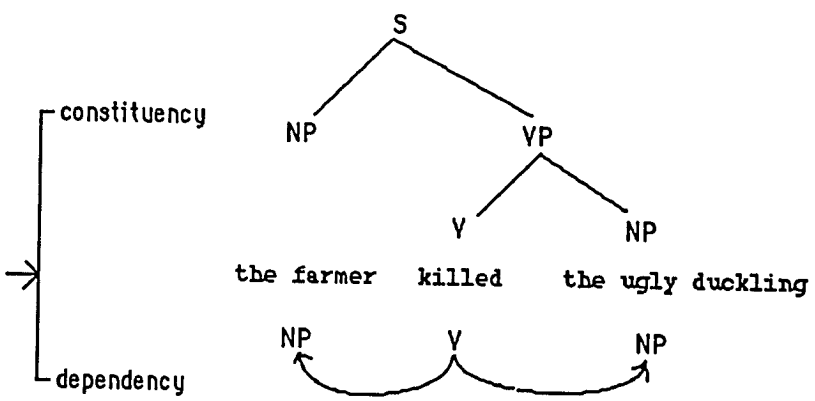


Fig. II:3.2-10: Alternative types of clause structure (dialectal)

Similarly, although function structure (e.g., Subject Finite/Predicator Complement) and syntagms of classes (e.g., n.gp. fl v.gp. fl n. gp.) have been presented as complementary conceptions of syntagmatic organization (for example by Halliday (1961, 1965) within systemic functional grammar, by Kac (1978) within corepresentation grammar, and by Bresnan & Kaplan (1982) within lexical-functional grammar), they have often been opposed as alternative conceptions of syntagmatic organization.

(ii) Diatypic variation in structure type. We also find diatypic variation -- different types of structure as complementary alternatives for talking about different modes of syntagmatic organization. The diatypic variation has been noted in different contexts by Pike (e.g., 1959) and Halliday (e.g. 1965b, 1979). In Pike's view, language can be seen as particle, field, or wave; these represent different complementary perspectives. As far as structure is concerned, particle is the traditional notion of constituency, whereas wave is more like dependency.

Like Pike, Halliday also identifies different modes of structure but he interprets them in terms of his theory of metafunctions; he associates them as modes of organization typical of different metafunctions. For example, he distinguishes between interdependency structure and constituency structure and suggests that they are the logical mode of structure and the experiential one, respectively. Let's look at diatypic variation in some more detail now.

3.2.3.2 Diatypic variation: different modes of structure

Halliday has suggested two contrasts in structure type that will be useful in the later discussion. Both are based on the metafunctional differentiation in grammar. I will introduce them briefly here and then explore them in further detail.

(i) Univariate vs. multivariate. One structural typology contrasts univariate structure, i.e. lineally recursive, structure (the logical metafunction) and multivariate structure (the other metafunctions) -- Halliday (1965, 1978: 113). A univariate structure involves repeated instances of just one variable, as in the case of the members of a modification structure or the members of a coordination structure. A multivariate structure involves multiple variables, each of which is (in principle) instantiated only once in the multivariate structure, as in the case of the transitivity functions of a clause (Actor fl Process fl Goal, etc.).

(ii) Interdependence, constituency, prosody, and pulse. The other typology operates with four types of structure and assigns each type to a particular metafunction (Halliday, 1979): constituency is assigned to the experiential metafunction, interdependency to the logical one, prosodic structure to the interpersonal one, and periodic structure (pulse) to the textual metafunction.

Constituency is the familiar type of structure -- the particle perspective, in Pike's (1959) discussion. It specifies elements of structure as parts of a unit whole.

Interdependency[6] defines elements of structure not as parts of a unit whole, but in relation to one another and in this respect the structure is relational; any given element is defined as interdependent upon another element. An interdependency structure is strictly ordered by the interdependency relation. There are two types of interdependency, parataxis and hypotaxis.

Prosody runs through a unit across constituency boundaries; from the point of view of constituency structure, it is thus 'non-segmental'.

Pulse operates by assigning varying degrees of prominence.

The two typologies intersect as follows. Interdependency is univariate; and constituency, prosody, and pulse can all be grouped as multivariate. They are tabulated below, together with examples (to be discussed in what follows):

[6] The notion of interdependency is not identical to the notion of dependency in dependency grammar. In fact, dependency is often a 'dialectal' variant of constituency and may not be applied to interdependency structures such as coordination.

mode of organization		metafunction	examples
univariate	interdependency	logical	modification tense coordination apposition
multivariate	constituency	experiential	transitivity epithet (in n.gp.)
	prosody	interpersonal	key polarity & modality attitude
	pulse	textual	theme information

Fig. II:3.2-11: Modes of structure and metafunction

Univariate and multivariate will be contrasted in Section II:3.2.4.1-3, univariate interdependency structure will be discussed in Section II:3.2.4..4, prosody in Section II:3.2.5, and pulse in Section II:3.2.6. Multivariate constituency is the notion of structure in the 'baseline' grammar; it is the mode of organization that is the basis of structure in Nigel.

3.2.3.3 Constituency in Nigel

Our familiar notion of grammatical structure fits the constituency mode of organization quite well; we speak of grammatical constituents and draw tree diagrams. More specifically, the realization operators discussed in Section II:1.2.2 are oriented towards constituency. The structuring operators (Insert, Expand, and Order) create constituency, while the layering and rank operators

rely on constituency.

1. *Insert* specifies the presence of a function as a constituent of a grammatical unit.

2. *Expand* explicitly creates a constituency relation between two functions.

3. *Order* operates on functionally defined constituents (of the same unit).

4. *Conflate* creates an identity relation between two constituent functions; the result is a constituent function bundle.

5. *Preselect* does not create constituency itself, since it specifies a constraint on how to realize a function, but it presupposes the re-expression of a constituent function of one unit (e.g. the Agent of a clause) as the structure of another unit (e.g. Epithet ^ Thing of a nominal group). In other words, preselection is in terms of the overall constituency organization.

The functions themselves are (labels of) constituents. For example, (i) they are segmental in nature; no function can stretch over more than one segment unless it stands in a constituency relation to other functions (through the application of the Expand operator). (ii) They are clearly bounded segments of a categorial nature; there is no gradience (cline).

The use of the operators is summarized diagrammatically below to bring out their creation of or reliance on constituency:

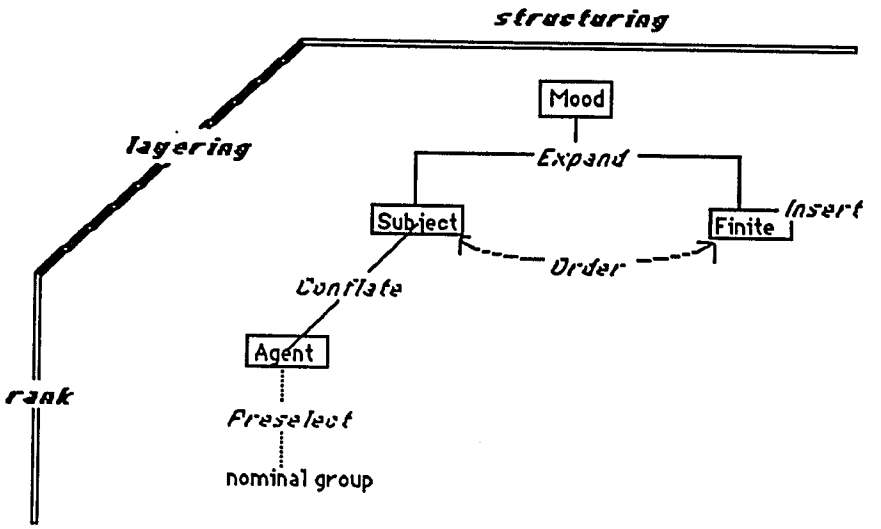


Fig. II:3.2-12: Realization operators and constituency

Each constituent in an experiential layer of structure has a unique value in relation to the whole; the organization is multivariate. For example, a transitivity structure is organized into functions such as Senser Process Phenomenon Manner Locative. Since constituency is the experiential mode of structuring, experiential realization statements are usually well accommodated by multivariate constituency organization. For example, if a mental clause is metaphenomenal, there is a preselection stated in terms of one of the multivariate functions, the Phenomenon: "Phenomenon: noun-clause". If a clause is an unmarked intensive ascriptive one, the Process is constrained to be 'be' and the Attribute is a group with either a nominal or an adjectival head.

Default orderings are also stated in terms of the multivariate constituent values. For example, we can state (Process Manner Locative), 'Process precedes Manner which precedes Locative'.

In contrast, realization statements other than those deriving from the experiential metafunction are not as easily accommodated by multivariate constituency. For example, logical realizations are stated more naturally in terms of (univariate) interdependency than in terms of constituency: see Section II:3.2.4 below.

The observation that the experiential mode of organization is (multivariate) constituency does not mean that there are no problematic cases. Linguists have sometimes felt a need to interpret structures as fusions/mergers and to leave constituent status indeterminate, interpretations that are outside the scope of Nigel's present set of realization operators.

3.2.4 The two ideational modes of organization

I will move in on the metafunctional differentiation of modes of organization from the ideational metafunction, focussing on structure types before turning to system types. There is a good reason for taking the ideational metafunction as the point of departure. There are two ideational modes of organization, one for each subtype of the ideational metafunction: the logical mode (interdependency) and the experiential mode (constituency). The logical mode of organization stands out quite clearly as different from the other metafunctional modes of organization, but the experiential mode of organization

has been used to represent all the other three modes (cf. Pike, 1959, on the prevalence of this constituency type of organization in linguistics) -- interpersonal (prosody) and textual (pulse) as well as experiential (constituency).

3.2.4.1 Multivariate and univariate

Let us first consider Halliday's (1965) definition of the two modes of grammatical structure known as multivariate and univariate. As we have seen, structure is not a string of (grammatical) classes such as NP V, NP V AdvP, and NP V NP; it is a configuration of functions (Halliday, 1966) or, in earlier terms, an arrangement of elements (Halliday, 1961).If we focus on the variability of the functional variables in a structure, we can identify two basic modes of structure:[7]

Using 'structure' in this sense, we can say that language exhibits two basic types of structure, the 'multivariate' and the 'univariate'. A multivariate structure is one involving more than one variable; a univariate structure is one involving only one variable. The elements of a multivariate structure are thus different variables each occurring once only; let us represents this for the moment as X.Y.Z. The elements of a univariate structure are repetitions of the same variable, which we can represent provisionally as X.X.X, or , for ease of reference, as X_1. X_2. X_3. (Halliday, 1965)

[7] The distinction between multivariate and univariate parallels Bloomfield's (1933) distinction between exocentric and endocentric (cf. Martin, 1988), but Bloomfield defined his distinction in terms of the distribution of classes and did not correlate the distinction with metafunction.

An example of the **multivariate** kind of structure is Actor Process Goal, as in the transitivity structure of the clause *he deleted the file.* There are three constituents and each stands in a distinctive relation to the whole, which we represent by three distinct function labels, Actor, Process, and Goal. A multivariate structure is usually represented as a configuration of functions in terms of constituency. Thus, *he deleted the file* is represented as follows:

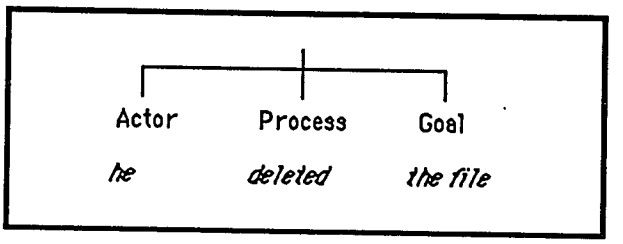


Fig. II:3.2-13: Multivariate constituency

I will refer to this mode of organization as ***multivariate constituency.*** Since each function has a distinctive value, the absence of one function will not affect the value of another function. For instance, in the passive *the file was deleted, the file* remains Goal although there is no Actor. Actor, Goal, and Process are functions of the whole clause.

An example of a **univariate** structure is the clause complex *Prepare some small rolls, remove from the oven, and slice off the tops.* We can represent this as X_1 X_2 X_3. In structures of this univariate kind, "the subscript numerals $_{1,2,3}$ do not define distinct variables but merely serve to record the occurrences of a single variable X" (Halliday, 1965). Univariate structure is organized on the principle of repeatedly instantiated tokens of one type and the token instantiation can be repeated indefinitely. A univariate structure is usually

represented as an interdependency chain of instantiations, simply numbered 1, 2, 3, and so on (the arrows symbolize the interdependency relations):

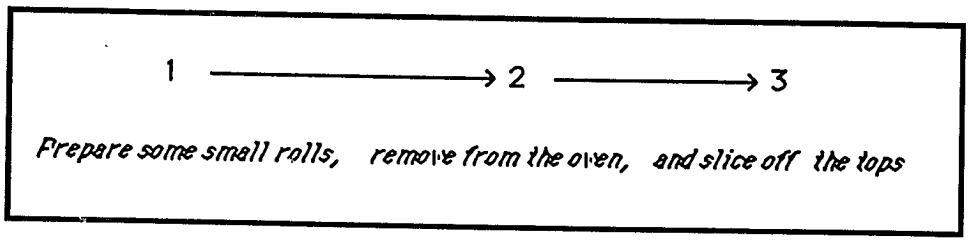


Fig. II:3.2-14: Univariate interdependency

Here 1 and 2 are interdependent and 2 and 3 are interdependent, thus forming an interdependency chain. They are not constituents of some whole.

I will refer to this mode of organization as ***univariate interdependency.*** Since each link in the interdependency chain is simply defined by being 'next' in the chain, the absence of the link in the chain it is next to will change its ordering in the interdependence. For instance, if the clause *remove from the oven* was not present in the structure above, the third clause would be the second token rather than the third: 1 *prepare some small rolls,* 2 *and slice off the tops.* The clauses in the complex are ordered as tokens in the interdependency chain, but they are not have distinctive variables (such as Actor, Process, and Goal) as constituent parts in relation to the whole clause complex.[8]

[8] The interpretation of the clause complex as a complex of clauses, i.e. as clauses combined by interdependency relations, contrasts with the interpretation of it as grammatical unit one rank above the clause, usually called a sentence. Longacre (1970) interprets it in this way as a sentence with a multivariate structure. To draw an analogy with a relational conception of structure such as that of Rhetorical Structure Theory (discussed briefly in Chapters III and IV; cf. Matthiessen & Thompson, 1987): the clause complex represents the relational aspect of the organization without positing any schemata.

3.2.4.2 The association with metafunction

If we focus on the experiential and the logical metafunctions, we can exhaust the two modes of structure, multivariate constituency and univariate interdependency, metafunctionally by correlating them with the experiential metafunction and the logical metafunction respectively.

(i) The clause *he deleted the file* is organized experientially as a multivariate constituency structure of transitivity: Actor Process Goal. A composite phenomenon of our experience, a configuration, is decomposed into component parts, a process and two different participants in this process.

(ii) The clause complex *prepare some small rolls, remove from the oven, and slice off the tops* is organized logically as a univariate interdependency structure, 1 2 3. It is organized according to the natural language logic of addition; one step in the preparation of the rolls is added to another for as long as is necessary to complete the representation of a sequence of steps in the preparation of the rolls.

According to Halliday, the experiential and the logical metafunctions are subtypes of the more general ideational metafunction. They are different ways of 'ideating', one more particulate and concrete (the experiential) and one more abstract and highly generalized (the logical); Halliday (1979: 73). They are contrasted in the diagram below as interpretations of the temporal contribution to the verbal group in English:

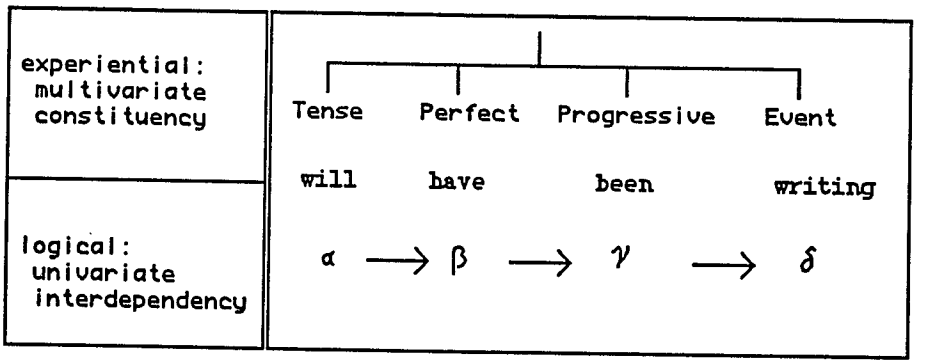


Fig. II:3.2-15: Two alternative ideational interpretations of the v.gp.

According to the experiential interpretation, time is componential: tense (Tense), phase (Perfect), and aspect (Progressive) are different and independent categories of time. According to the logical interpretation, time is serial: tense is simply selected again and again and the temporal series is represented by an interdependency chain. The two are alternative interpretations and in this case the logical one has more explanatory power; for instance, it accounts for the interdependencies among verb forms (*have + -en,* etc.) -- see Matthiessen (1988) for more detail.

3.2.4.3 The complementarity of the two structure types

From the examples given above, the clause, the clause complex, and the alternative interpretations of time in the verbal group, we might conclude that the two subtypes of the ideational metafunction are in complementary distribution; i.e., that the grammar treats everything as either experientially organized ***or*** logically organized. This is true of the clause and the clause

complex. From an ideational point of view, the resources of the clause are experiential, and its structural mode of organization is experiential; it has a multivariate transitivity structure. The resources for complexing (combining) clauses are logical; and the structural mode of organization is logical; it is univariate interdependency.

To preserve the complementarity (the alternation between experiential and logical) we have just observed, it is tempting to hypothesize that from an ideational point of view ***simple units*** such as clauses, prepositional phrases, nominal groups, verbal groups, and so on, are experiential constructs, and that ***complexes*** of units of all kinds (clause complexes, nominal group complexes, and so on) are logical constructs.[9] The second part of the hypothesis can be confirmed. Complexes are logically organized, regardless of what they are complexes of. The general principles of complexing are independent of the rank and class of units: cf. Section II:2. For instance, clauses, groups (nominal, verbal, and adverbial), and words (nominal, verbal, and adverbial) are all open to the same basic resources and patterns of coordination by *and* and *or*. Apposition is similarly general across ranks and classes. This high degree of generality makes good sense, for, as Halliday as pointed out, the logical subtype of the ideational metafunction is highly abstract and generalized.

The first part of the hypothesis, the claim that all simple units are experientially organized, cannot be confirmed, however. It is true of clauses and prepositional phrases; as ideational constructs, these can be interpreted exhaustively in

[9] It would follow from this hypothesis that classes (nominal, verbal, adverbial, etc.) and the rank scale have an experiential basis, since they classify and rank units.

experiential terms. (Both have been cited as examples of exocentric structuring; see Bloomfield (1933) and Hockett (1958).) However, it is not true of groups, which are either both experiential and logical or primarily logical. Halliday (1985) shows how the nominal group is organized both experientially ***and*** logically and how the adverbial group can be interpreted in logical terms alone. Let me give a few examples from each class of group.

(i) Nominal group. The nominal group needs both a logical and an experiential interpretation. The experiential interpretation accounts for the multivariate nature of the nominal group, in particular:

(a) certain unique function variables such as Deictic, Postdeictic, Ordinative, Numerative, and Thing;

(b) sequence statable in terms of these (e.g., Deictic fl Postdeictic fl Ordinative fl Numerative fl Thing); and

(c) differences in the classes that realize them (e.g., Deictic: determiner, Postdeictic: adjective [of a particular subclass], Ordinative: ordinal / superlative adjective, Numerative: numeral, and Thing: noun).

As an illustration, consider the nominal group *the next nine months,* taken from the following example.

The vederala made no further attempt to molest Silindu, and (Deictic:) *the* (Ordinative:) *next* (Numerative:) *nine* (Thing:) *months* were a period of unwonted prosperity and happiness in the 'Vedda' family. (L. Woolf, p. 76)

We can account for most aspects of this nominal group by positing an experiential multivariate constituent structure, where each element is a unique variable, viz. Deictic (specifying the deixis of the group), Ordinative (specifying the quantitative or qualitative ordering of the group), Numerative (specifying the number), and Thing (specifying the basic category of thing); the sequence is stated in terms of these variables, viz. Deictic ^ Ordinative ^ Numerative ^ Thing; and they are all realized by different classes, viz. Deictic: determiner, Ordinative: ordinal, Numerative: numeral, and Thing: noun. The experiential interpretation is diagrammed below together with the logical one, according to which Thing is the head of the nominal group and the other elements are all modifiers.

the	next	nine	months
$\delta \leftarrow$	$\gamma \leftarrow$	$\beta \leftarrow$	α
Deictic determ.	Ordinative ordinal	Numerative cardinal	Thing noun

Fig. II:3.2-16 : Logical and experiential structures of nominal group

In this case and in cases like it with the functions Deictic, Postdeictic, Ordinative, Numerative, and Thing, we can represent the nominal group without using the logical component. However, if we turn to nominal groups such as

a rather select and fairly sheltered residential secretarial college (CEC, p. 703)

a rusting metal golf club

a large open Bentley

a slimy, swollen, disintegrating grey head (Farrell, Grip)
thermal metamorphic rock

we need the resources of a logical interpretation as well to take account of the repeated pre-modifiers of the same experiential type. Experientially, these are Epithets and Classifiers (for the distinction, see e.g. Halliday, 1985: 164 and Fries, 1970, who calls them loose knit and close knit modifiers). Logically, we can simply treat them as repeated instances of premodifiers, as in the analysis of *a slimy, swollen, disintegrating grey head* given below:

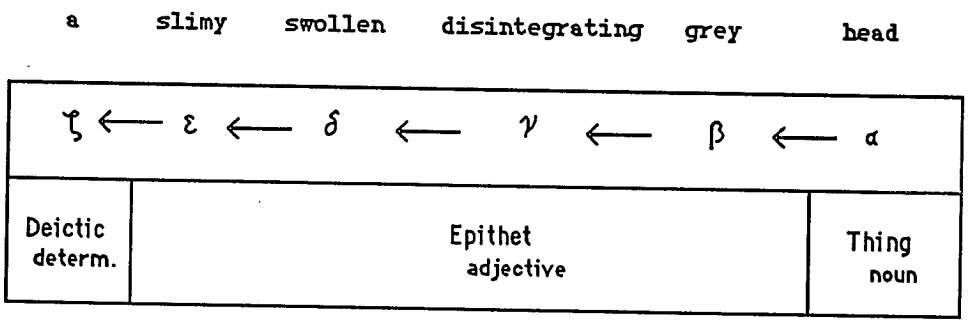


Fig. II:3.2-17: Logical analysis to account for repeated Epithets

We see then that to give a complete account of the nominal group, we need the logical interpretation as well as the experiential one: they complement one another in that they account for different aspects of the nature of the nominal group.

(ii) Verbal group. In the verbal group, the multivariate contribution is less dominant than in the nominal group. While it is possible to identify a multivariate

constituency structure with the functions Finite, Auxiliary, Voice, and Event, it is the univariate interdependency structure that is the clue to the organization of the verbal group. It accounts for

(a) the sequence of auxiliaries and the lexical verb -- the sequence simply reflects the ordering in dependency;

(b) form dependencies such as *have + -en;*

(c) the linear recursion; and

(d) the realization classes, which are all verbs.

In addition, the logical interpretation brings out the way in which the grammar of the verbal group represents the semantics of serial time (see e.g. Matthiessen, 1988). As an illustration of the verbal group, consider the following answer.

A: So when is this thing scheduled to produce results, Frank?

B: Oh, it *'s been producing* results for a long time

(CEC, p. 482)

The analysis of the verbal group *'s been producing* is given below together with two more complex groups.

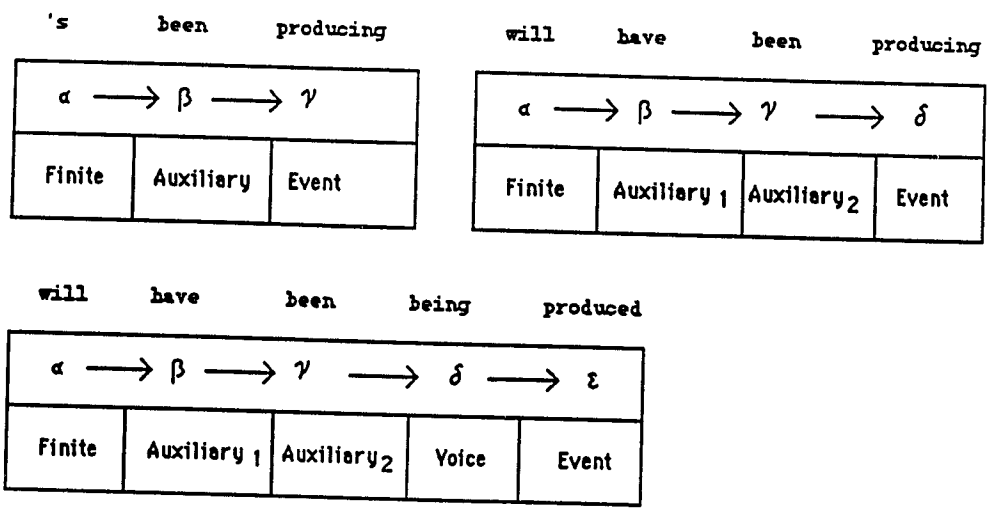


Fig. II:3.2-18: Verbal group structures

(iii) Adverbial group. Halliday (1985) interprets the adverbial group entirely in terms of logical structure. The last of the following examples --

> in order to cost the book *reasonably accurately* ...
> *How much more comfortably* are things arranged now (from Jespersen, 1937: 32)

-- is analyzed as an illustration.

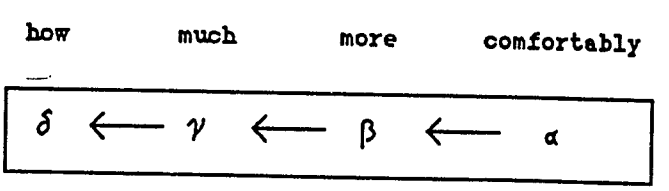


Fig. II:3.2-19: Logical structure of adverbial group

To sum up, all groups are organized logically. The contribution of the experiential mode of organization is variable: it very clear in the nominal group, but does not have to be posited for the adverbial group. We can find the beginning of an explanation of the logical organization of groups in Halliday (1985: 159): A group is a group of words; it is "in some respects equivalent to a WORD COMPLEX -- that is, a combination of words built up on the basis of a particular logical relationship ... [it] is an expansion of a word". So, although a group is a unit at group rank rather than only a logical complex at word rank, it is organized partly on the logical principles of a word complex. In contrast, a (prepositional) phrase "is a contraction of a clause" and as a contracted mini-clause it is experiential and multivariate rather than logical and univariate.

If we look at the two types of ideational organization from the point of view of the rank scale, we can generalize as follows: Units at the highest rank, the clause rank, are experientially organized. In particular, the transitivity structure of a clause is multivariate. Units at the rank immediately below are (i) experientially organized -- the prepositional phrase; (ii) experientially and logically organized -- the nominal group; or (iii) primarily logically organized -- the adverbial group. We can call the rank between clause rank and word rank phrase/group rank to bring out the differentiation in the modes of organization of phrases and groups: "Starting from opposite ends, the two achieve roughly the same status on the rank scale, as units that lie somewhere intermediate between the rank of a clause and that of a word" (op cit., p. 159).

The observations regarding the interaction of the two ideational modes of organization are summarized diagrammatically below. I, II, and III refer to the

first three positions on the rank scale.

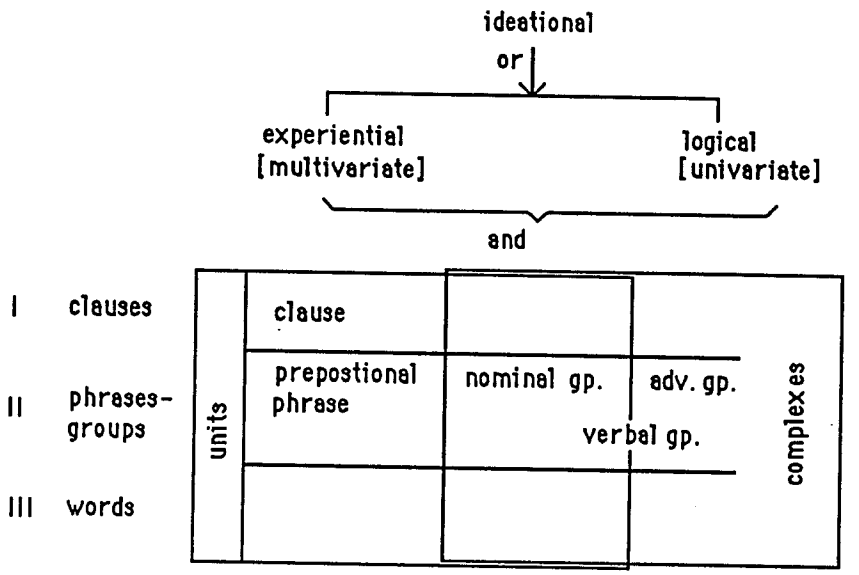


Fig. II:3.2-20: Interaction between the two subtypes of the ideational metafunction

For our purposes, the significance of the situation we find in grammar is that it brings out the differentiation and complementarity of the two modes of ideational organization, but it also shows that they can both be applicable at the same time. This has obvious consequences for representational frameworks; for example:

> from an ideational point of view, the clause should not give us any metafunctional problems, since it is experiential rather than logical and the structure type defined in Nigel is experiential constituency.

from an ideational point of view, the clause complex should be quite problematic, since it is logical rather than experiential and the structure type defined in Nigel is experiential constituency, not logical interdependency.

from an ideational point of view, the nominal group should be something of a mixture in terms of problems, but we can expect experiential constituency to do a better job for the nominal group than for the clause complex.

[3.2.3.3 LOOKING FOR SOLUTIONS

I will discuss various problems of representation and will mention a few possible solutions. I will try to diagnose the problems in terms of the four different metafunctional modes of organization, suggesting specific problems associated with each of the non-constituency modes.

What of solutions, where can we find them? If we take natural language as a model for our "language" of representation, two of the methods for expanding the potential that suggest themselves are metaphor and borrowing.

(i) Metaphor. The prevailing metaphor is in a sense the source of the problems discussed in this paper. It is the constituency metaphor: Treat all modes of structuring as if they were constituency. For example, as I showed above (section 4.2: Representation of prosody by constituency), a prosody running across constituents can be represented as if it was a function expanded by these constituents and a pulse can also be represented as if it was a function expanded by the functions affected by the pulse (section 4.3: Representation of pulse by constituency).

(ii) Borrowing. We may borrow from other systemic "dialects": Problems for Nigel may not be problems for Fawcett's and Hudson's

grammars, for example. We may also borrow resources from other grammatical frameworks to represent aspects of systemic theory. Some frameworks are typologically too far away from the systemic one; we are not likely to find much of any use to us in transformational grammar. Other framework are typologically much closer and in some cases there is a long tradition of exchange, e.g. stratificational linguistics. One kind of representation close enough to be of considerable interest is Kay's Functional Unification Grammar. I have not explored it in this paper, but have pointed to places where a FUG treatment is developed in Kasper's paper in this volume. Finally, we may borrow representational resources from other disciplines which have strong notions of e.g. processes and non-constituency organizations.]

3.2.4.4 Logical structure: interdependency

As we have seen, the logical metafunction generates interdependency or chain structures. Realization statements deriving from the logical metafunction are easier to state in terms of interdependency than in terms of constituency. Experiential realization statements make reference to (multivariate) functions with unique values in relation to the whole. Logical realization statements make reference to (univariate) functions whose values reflect their logical ordering in interdependency. When a logical element of structure is inserted, it is inserted as interdependent on the previous logical element and not as a constituent of some whole. The structure is thus like a chain. Each new link is defined in relation to the previous link. When a logical element is sequenced, it is sequenced in relation to the previous link in the chain. And when there is a preselection of an element, the preselection applies to the element that is currently the 'next' element in the chain. We can call any current pair in a logical interdependency chain Intiating and Continuing (parataxis) or Dominant and Dependent (hypotaxis).

The general representational problem with interdependency structures is that there are currently no realization operators that can be used to specify them. The Insert operator cannot be used to insert a logical function, since it inserts a function as a constituent of some unit and not as interdependent on another function. There are similar problems with Order and Preselect.

There are, in principle, two approaches to the specification of interdependency structures:

(i) We can define a new set of realization operators that work in terms of interdependency rather than constituency; or

(ii) we can redefine the old set of realization operators so that they work in terms of constituency or dependency depending on the context in which they are used.

According to the second approach, 'Insert X' would mean 'insert X as a constituent' if used in the context of a feature of an ordinary system but it would mean 'insert X as a link in the interdependency chain being developed' if used in the context of a feature of a logical recursive system. It may be possible to develop this second approach. However, I will adopt the first approach for ***insertion.*** It has the advantage that it is additive: it does not require us to redefine the old insertion operator. Moreover, it means that the effects of the insertion operators are uniquely determined by the operators themselves. In addition to the old insertion operator used to introduce a function as a constituent, as in +Actor, we need a general operator for inserting an interdependent function, viz. ->, as in -> Dependent. Although it may be possible to presuppose the function another function in inserted as interdependent on, the interdependency operator really requires two arguments, as in Dominant -> Dependent: Dependent is inserted as interdependent on Dominant.

In fact, we need two variants of the interdependency operator: one to create paratactic interdependency and one to create hypotactic interdependency. I will symbolize them as follows:

paratactic insertion	Initiating $\xrightarrow{p}$ Continuing
hypotactic insertion	Dominant $\xrightarrow{h}$ Dependent

Fig. II:3.2-21: Two variants of the interdependency operator

The two operators are different in a number of respects. These differences mean that once the structural relation of a function has been determined as constituency or interdependency by the way in which it is inserted, the structural context has been set up for the application of other realizational specifications.

Ordering. It is possible to make certain assumptions about the sequence of functions in the context of interdependency. The logical ordering specified by the paratactic operator is translated directly into progressive sequence. The logical ordering specified by the hypotactic operator may be translated either into progressive sequence (as for the verbal group) or regressive sequence (as for premodifiers in the nominal group); the dependent function may also be included in the dominant one.

	insertion	ordering
parataxis	Initiating $\xrightarrow{p}$ Continuing	as automatic consequence of insertion: Initiating ^ Continuing
hypotaxis	Dominant $\xrightarrow{h}$ Dependent	default either progressive Dom ^ Dep ; or regressive Dep ^ Dom according to grammatical context

Fig. II:3.2-22: Ordering and interdependency

Preselection can similarly have different interpretations depending on whether it operates in terms of a constituent function or an interdependent one. Paratactic structure is transitive with respect to preselection: preselections spread along a paratactic interdependency chain. Hypotactic structure is not transitive: preselections are confined to the head of a hypotactic interdependency chain.

In the current Nigel grammar, preselection statements are always satisfied without any mediating steps. For instance, the specification

Subject: nominal group, noninteractant

means that the grammar will be re-entered to realize Subject and that the features 'nominal group' and 'noninteractant' will be chosen. As long as the nominal group is a simple one, this is exactly what we want. Thus, in *Henry made plans to invade France,* the grammar is re-entered to realize the Subject

and 'nominal group' and 'noninteractant' can both be chosen during that pass through the grammar. However, if the nominal group is a complex one, the full set of preselected features cannot be instantiated until each simple nominal group of the complex is to be developed. Thus, in *Henry and Anne, Mary, or Elizabeth made plans to invade France,* the full preselection set cannot be instantiated until the simplex nominal groups that make up the complex have been reached. This 'delay' is diagrammed below.

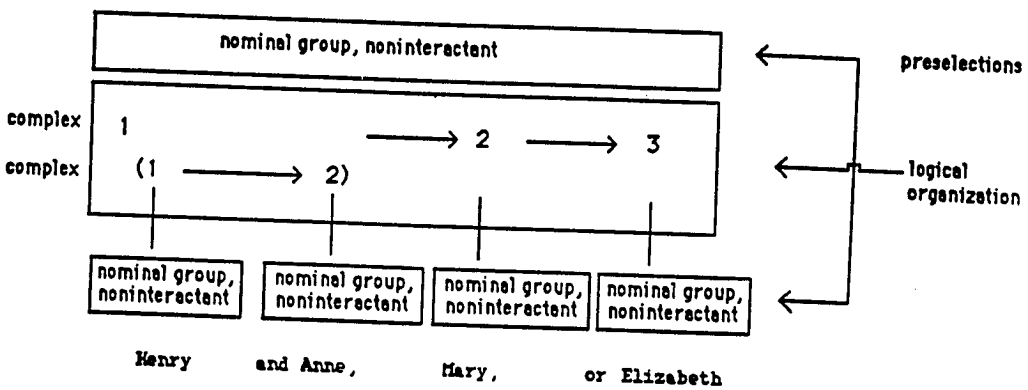


Fig. II:3.2-23: Preselection and (layering of) complexes

In the example above, the preselection set is not instantiated immediately upon re-entry of the grammar, but is distributed across the elements of the nominal group complex and also the subelements created by internal nesting. It is important to note here that the repeated instantiation of preselection sets applies to paratactic interdependency but not to hypotactic interdependency. In the case of hypotaxis, only the dominant or head element is, as a rule, directly affected by preselections.

3.2.4.5 Examples of interdependency structure

The logical resource of the grammar were tabulated in Section II:2; examples of logical interdependency structures include:

	complex		simplex
	parataxis	hypotaxis	
clause	clause complex (coordination, apposition,	non-restrictive relative clauses, 'adverbial' clauses)	
group, nominal	nominal group complex (coordination, apposition,	restrictive apposition)	modification
verbal	verbal group complex (coordination, apposition,	'catenation': phase etc.)	tense, voice, etc.
word	word complexes (coordination,	compounding)	derivation

Fig. II:3.2-24: Logical resources

I will discuss clause coordination and tense only.

(1) Clause complexes

Realization statements for paratactic clause combining need to refer to the interdependency structure set up by the realization operator '-p->'. Consider paratactic clause complexes of the type traditionally referred to as coordination. Specifications of (i) sequence, (ii) structural markers, and (iii) structural ellipsis all reflect the logical interdependency structure assigned to examples of coordination, as in the following example.

(1:) A liquidizer makes this dressing to perfection
(2:) *and* __ takes much less time.

(i) Sequence. As suggested above, the paratactic insertion operator automatically leads to a specification of sequence: by convention, Initiating -p-> Continuing also means Initiating ^ -p-> Continuing; i.e., in any link in the interdependency chain, the initiating element always precedes the continuing one.[1] Thus, the sequence of coordinated clauses reflects the order in which they are coordinated. For instance, if we start the chain in the example above with an initiating 1 and then add a continuing 2, the sequence will be 1 followed by 2:

[1] The only potential exception is inclusion of the continuing 2 within the initiating 1, as in (2<1>) "Your friend," he said with a wry smile, "is an honourable man." The treatment of examples of this kind will depend on how they are analysed. We find this also with hypotaxis (β<α>): She would, she promised, finish the report by 5.

order of generation	1	⟶	2
sequence	1		2
	A liquidizer makes ...		*and takes*

Fig. II:3.2-25: Logical ordering and realizational sequence

(In contrast, the hypotactic paraphrase would not have the sequence automatically predetermined:

β ^ α : Besides taking much less time, a liquidizer makes this dressing to perfection.

α ^ β: A liquidizer makes this dressing to perfection, besides taking much less time.

α <β>: A liquidizer, besides taking much less time, make this dressing to perfection.

However, we can specify the progressive sequence α ^ β as the default one for clause complexes; the sequence β ^ α is a thematically marked variant.)

(ii) Structure markers. Structure markers such as *and* and *or* are specified by reference to the ordering of the interdependency chain, either before each newly added link or before the last link. That is, each time the clause complexity system is traversed, a new link is added (1, 1-P->2, 2-P->3) and as each new link standing in the same relation as the previous one is

added, the potential for marking the structural relationship is pushed forward in the chain. That is, it is always specified as a preselection for the current Continuing element, but does not have to be instantiated until the last Continuing element has been reached:

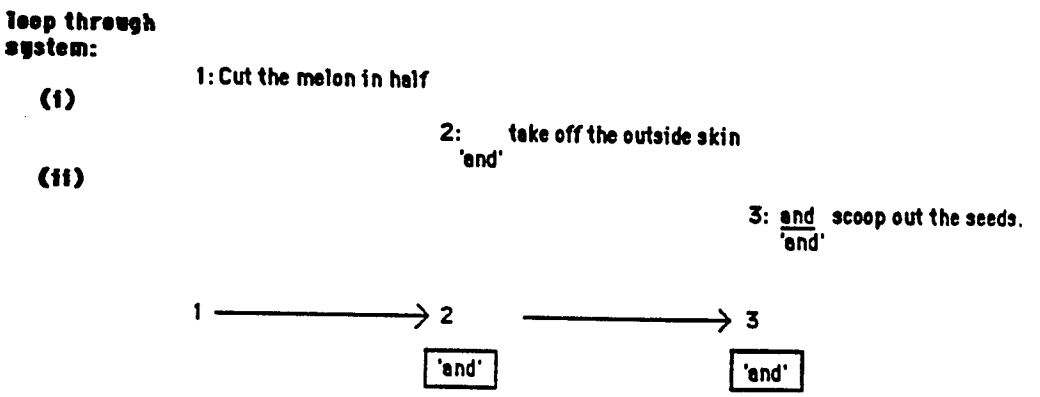


Fig. II:3.2-26: Developing an interdependency chain in two cycles with preselection

Markers of logical relationships thus contrast with both case marking and marking by preposition, which are associated with constituents of particular values such as Agent, Locative, and Means:

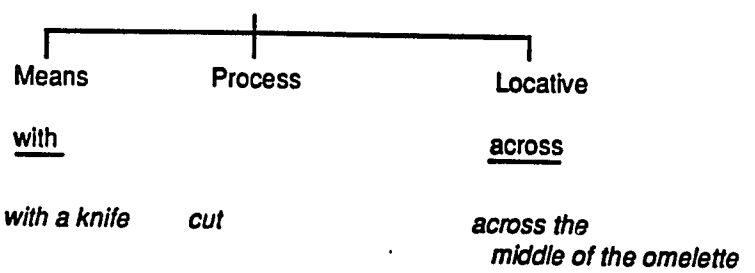


Fig. II:3.2-27: Multivariate markers

(iii) Structural ellipsis. Furthermore, structural ellipsis is determined by interdependency relations. For example, Subject ellipsis works forwards in the interdependency structure (progressive ellipsis) while Complement ellipsis works backwards[2] (regressive ellipsis). The principle of differentiation comes from the interpersonal metafunction, more specifically from its organization of the clause into Mood and Residue. Examples of structural ellipsis include:

(i) progressive ellipsis (ellipsis in continuing clause[s])--

Mood ellipsis: Subject, Finite, or Mood

They'll fly to Paris, __ rent a car, and __ drive down to Nice.

Residue ellipsis: all of Residue

They will fly to Paris for the summer and we might ___

(ii) regressive ellipsis (ellipsis in initiating clause) -- Residue ellipsis:

Residue ellipsis: all of Residue

They will ___ and we might fly to Paris for the summer.

Residue ellipsis: Complement, Adjunct

[2] Alternatively, we might call this anticipatory ellipsis, if we think of ellipsis as part of the unfolding of the clause complex; cf. below.

They will fly ___ and we will drive to Paris.

They bought ___ and we leased a car.

(There are, of course, a number of more complex cases involving the Predicator, as in *We're driving to Anza Borego on Saturday and __ to Idlewild on Sunday; we're driving to Anza Borego on Saturday and Henry __ on Sunday.*) While structural ellipsis is a representational problem that has to be solved, it is clear that it makes reference to direction in the interdependency structure, not to constituency.

Furthermore, structural ellipsis can continue as far as the interdependency chain continues. For example, each new clause added to the complex may presuppose the Subject from the previous clause and be marked by *and* if the relation is one of conjunctive coordination. The interdependency structure for the clause complex *Here indeed the old woman did fall out of her chair and was gathered up by Pepita and led back to her bed* (TW 30) is diagrammed below underneath the example. After the first clause, the Subject is presupposed and after the second clause the Finite is also presupposed.

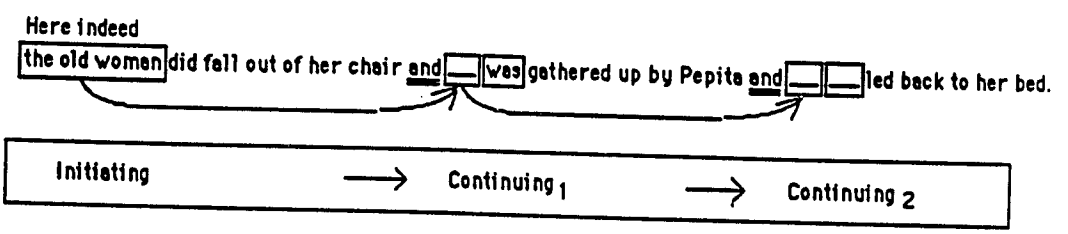


Fig. II:3.2-28: Progressive ellipsis

The conditions for structural ellipsis are created by the logical metafunction, but the resources of ellipsis are under ***textual*** control. The general meaning of ellipsis (and substitution) can be stated as *"continuity in the environment of contrast"* (Halliday & Hasan, 1976: 316). The representational problems associated with structural ellipsis are thus part of general problems associated with the textual metafunction. They can be understood in terms of the 'second order' or enabling nature of the textual metafunction with respect to the two others, the ideational and the interpersonal functions (cf. Section II:3.2.6 below). However, I will just mention a way of thinking about structural ellipsis.

In work on planning in AI, Sacerdoti (1978) has suggested an approach where the planner develops a plan by decomposing large tasks into smaller subtasks and expanding the plan to include subplans for these. In a sense, this is like planning a sentence. The planner may discover that the task can be decomposed into subtasks corresponding to clauses and that the plan can be expanded into a plan for a clause complex. As the expanded plan is expanded, certain common subparts may be discovered and instead of repeating these tokens of the same type of subpart, the planner can join them into one part. Similarly, in developing a clause complex, the generation procedure should be capable of discovering that certain types such as Subject and Finite can be represented by one token rather than several: when a clause constituent of a clause that is a link in a clause complex is about to be realized, the generator can check whether it is realized in a logically preceding or subsequent clause. If it is, that realization may 'stand for' the current clause constituent and it need not be realized separately. In this view, ellipsis is a matter of monitoring the process of planning in order to discover opportunities for reducing the number of executions of the same subtask. In the example used above, the identical

subtasks are Subject: "the old woman" and Finite: "was" (within Mood) and they are executed once only:

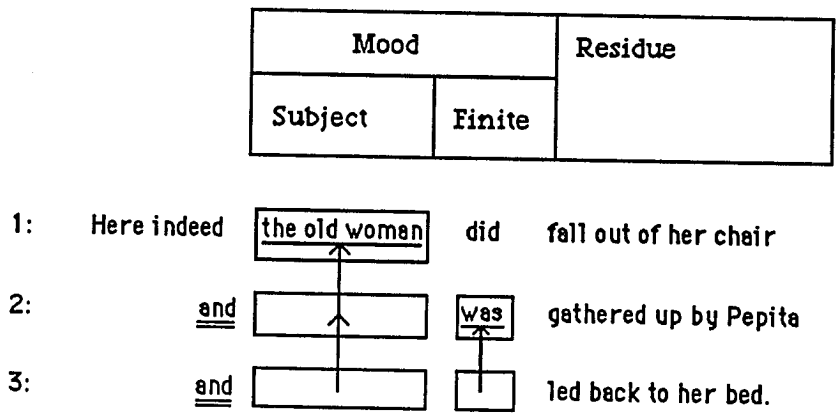


Fig. II:3.2-29: Ellipsis as previously performed task

As the plan for the clause complex is worked out, the logical metafunction sets up the conditions for structural ellipsis and the textual metafunction monitors for opportunities to aid the listener by identifying 'continuity in the environment of contrast'. This is only a way of thinking about structural ellipsis in generation and there are a number of details that would have to be discussed. But it is important to note the general character of this approach: it is dynamic in that it is part of the process of planning in generation and it does not treat ellipsis as a post-generation process of deleting parts of the final wording.

(2) Verbal groups: Tense.

As an example of tense structure, I will take the verbal group *'ll have been going to be being tested* from Halliday's example below (Halliday, 1976: 145):

Can I use that machine when I come in at this time tomorrow?
No -- it's going to be being tested.
It'll have been going to be being tested every day for a fortnight soon.

The logical structure given to the verbal group includes tense and voice auxiliaries as follows.

'll	have	been going	to be	being	tested

$$\alpha \longrightarrow \beta \longrightarrow \gamma \longrightarrow \delta \longrightarrow \varepsilon \longrightarrow \zeta$$

Fig. II:3.2-30: Logical interdependency structure of verbal group

Realization statements have to specify the sequence of the functions of the verbal group and they have to specify the inflectional forms. Both specifications are stated most naturally in terms of the dependency ordering.

(i) Sequence. A dependent function follows the function it is dependent on: β follows α , and so on. The default sequence in a hypotactic chain follows the

hypotactic ordering (either progressively or regressively) and for the verbal group we can state that the progressive sequence is the only option: Dominant -h-> Dependent also means Dominant fl -h-> Dependent.

(ii) Inflection. The inflectional form of the verb realizing a dependent function is determined by the realization of the function it is dependent on: *have* (β) determines the past participial form of *been going to* (γ). This follows the generalization that preselection in the context of logical structure follows the direction of dependency.

(For a thorough discussion of dependency and auxiliary order, see Schachter, 1981; for a discussion of the logical organization of English tense, see Matthiessen,1988.)

3.2.4.6 Ideational system types

I will now turn from logical structure to logical systems. Logical systems have in fact long been recognized as having a special status. The representational problem that arises from this special status was mentioned in Section II:1.1.5 and I will return to it now.

The experiential mode of meaning leads to multivariate constituency structures and the systemic organization is similar: in an **experiential system network**, systems have unique multivariate feature values and are ordered hierarchically in delicacy. We have seen examples from the area of transitivity and will see further examples in Section II:4.5.1. The interpretation of the system

network as *classification* works quite well. The other metafunctions raise representational issues. This is true particularly of logical and textual systems. I will look at them in that order.

In a **logical system network**, systems are (linearly) recursive. The recursion is represented by a loop back to the entry condition in the system, as in the figure below:

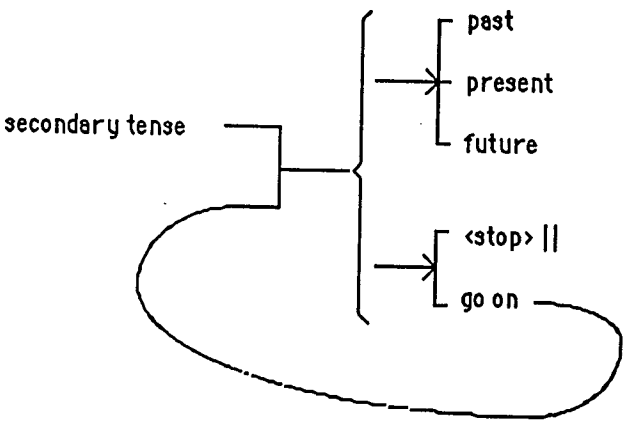


Fig. II:3.2-31: Recursive system in the logical component:
SECONDARY TENSE

Logical systems and system networks can no longer be interpreted in terms of classification. Henrici (1966)'s diagnosis of the problem with recursive systems has already been quoted (Section II:1.1.5). They cannot be represented formally in the same way as "conventional systems". The output of the system also provides an input to it (the loop above). Systemic features are distinguished by their names, and since the features 'past', 'present', and so on can be chosen more than once there is a naming problem. It is not clear how

the features chosen the first time are distinct from the features when chosen the second time, and so on. This is related to Henrici's remarks about partial ordering. Moreover, how is a realization statement to be applied recursively when a system is entered more than once?

One approach towards a solution is in terms of the type-token distinction. We can think of a system as ***a system type. Each time it is entered a system is instantiated as a token*** of the type. For conventional systems, there would only be one token per pass through the grammar, but recursive systems would allow multiple tokens. These tokens would have to be ordered by a counter so that each token has a unique place in the ordering: token 1, token 2, token 3, and so on. For instance, two cycles through the tense system diagrammed above would correspond to two instantiations, differentiated by a 'counter' recording the successive cycles as subscripts on the features.

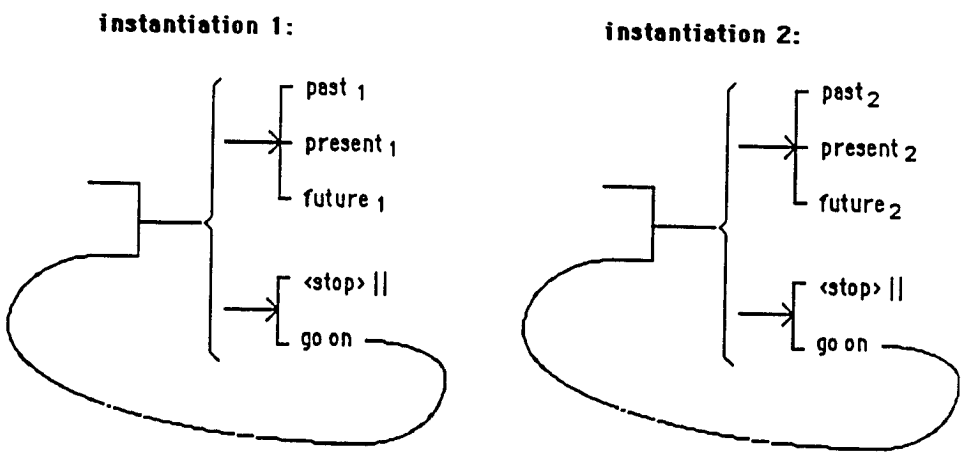


Fig. II:3.2-32: Two successive instantiations of the tense system

In this approach, the difference between multivariate and univariate is the difference between instantiations of multiple types and multiple instantiations of the same type. For example, in the multivariate structure Actor Process Goal Recipient *(I gave the report to Henry)*, the participants are inserted by realization statements associated with three different systems. In the univariate structure 1 2 3 [and] 4 *(Tom, Dick, Harry, and Henry)*, the coordinates are inserted by the same system in successive instantiations of it.

Now, there are at least two ways of achieving the effect of separating different instantiations of logical systems. (i) One is to count individual features as they are selected from successive entries of systems, as the subscripts in the tense system above implies. (ii) Alternatively, we can count more globally -- count system network entries rather than feature selections by assigning each successive entry of the system network to an instantial 'workspace'. Two successive network entries partitioned into successive workspaces are diagrammed below.

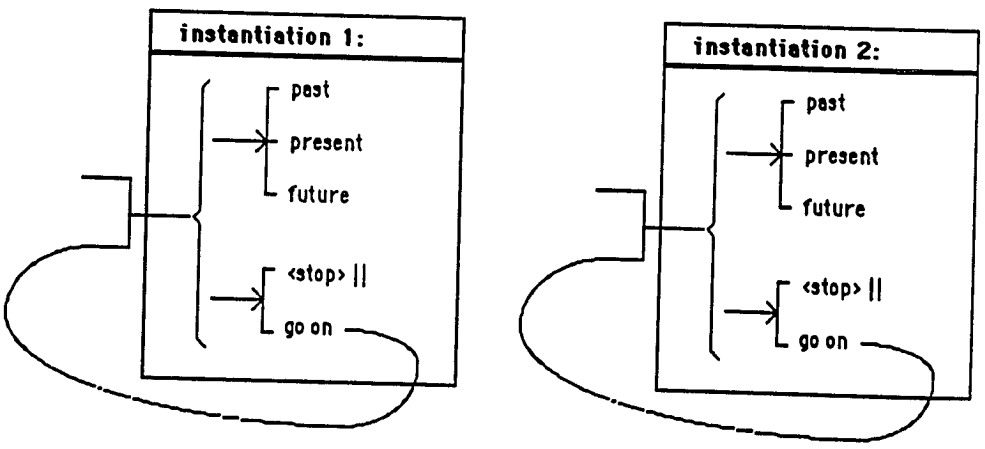


Fig. II:3.2-33: Two successive instantial workspaces

Looping back to re-enter the simultaneous systems is not like entering a system within a cycle through the grammar; rather, it is like re-entering the *grammar* (cf. Section II:1.2.1.6) with the important difference that the re-entry is initiated from the network itself without the intermediate step of going through preselection of a functional constituent: re-entry is a systemic choice not an automatic consequence of the structure set up by the rank-scale. And it is here that the interdependency nature of logical structure comes into play. Each decision to go on to a new cycle through the set of logical systems takes the old interdependent link as its linear starting point and produces *one new interdependent link* in the structure. We can see how this works for the verbal group *'ll have been going to be being tested* discussed earlier; diagrammatically:

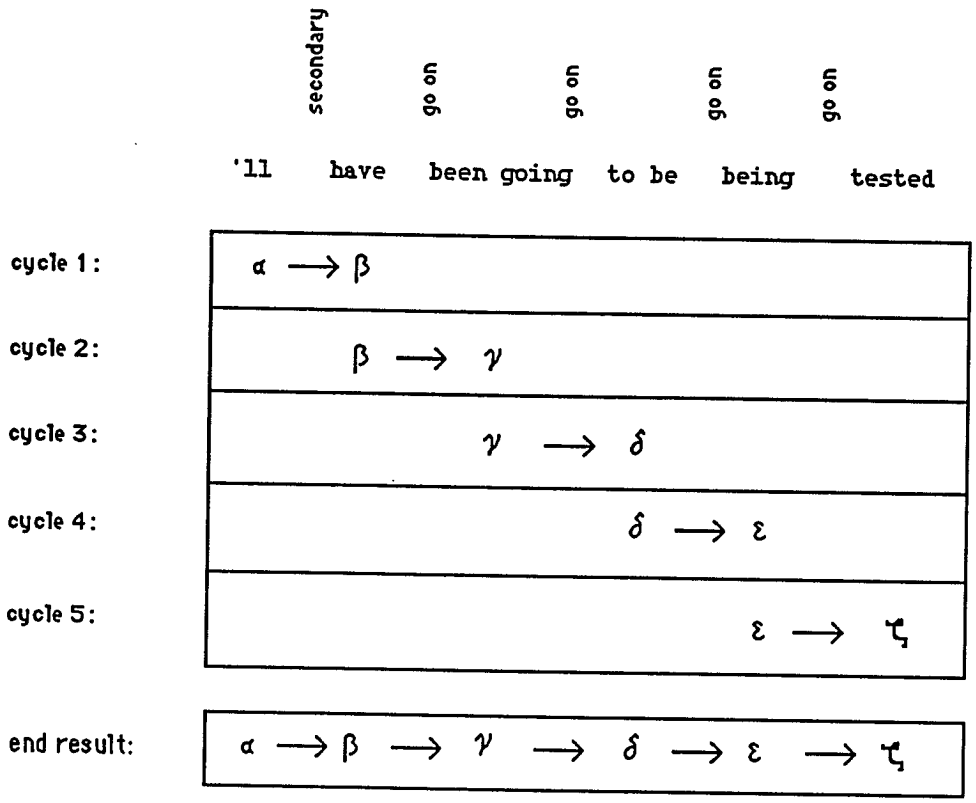


Fig. II:3.2-34: Pairwise construction of logical structure

When secondary has been chosen, the first interdependent link, β, is inserted and the instantial copy of the resources of secondary tense is entered; in this cycle (1), the feature 'past' is selected and 'go on' is chosen from the simultaneous system, which leads to the interpretation of β as the dominant link for the insertion of a new dependent link γ. A new instantial copy of the resources of secondary tense, i.e. a new workspace, is entered with the new pair β -> γ. In this cycle (2), the feature 'future' is selected and 'go on' is again chosen, inserting δ as dependent on γ, thus setting up γ -> δ as the new pair

in the developing logical structure. A new instantial copy of the resources of secondary tense, i.e. a new workspace, is entered with the new pair γ -> δ. In this cycle (3), the same procedure is followed; the cycling through of successive copies of the tense resources continues until the option || is selected.

As the example illustrates, the logical structure is built up one pair at a time: in this case, the members of the pair are Dominant and Dependent, since the structure is hypotactic --

	Dominant → Dependent	
cycle 1:	$\alpha \longrightarrow \beta$	'll have
cycle 2:	$\beta \longrightarrow \gamma$	have been going
cycle 3:	$\gamma \longrightarrow \delta$	been going to be
cycle 4:	$\delta \longrightarrow \varepsilon$	to be being
cycle 5:	$\varepsilon \longrightarrow \zeta$	being tested

Fig. II:3.2-35: Successive pairs of Dominant and Dependent

(In the case of parataxis, the pair would be Initiating and Continuing.) In a sense, the grammar only knows about the 'here & now' of the current pair of Dominant and Dependent in any given cycle. The complete logical structure is simply the *record* of successive cycles. The grammar can recognize the extremes of the logical structure, since it is clear when the cycling starts and when it ends, i.e. when the feature || is selected. The grammar does not have to

keep track of absolute positions in the logical structure, nor does it have to relate non-adjacent members of pairs.[3]

In the baseline grammar sketched in Section II:1, there is clear distinction between the static system potential (and associated realization statements) and the generation algorithm. The latter manages cycles through the grammar: re-entry is handled by the algorithm. In this sketch of the logical grammar, the distinction between the two abstractions is blurred. Or, to put this in another way, logical grammar (as presented here) embodies a dynamic account: the account of re-entry is part of the system network itself and so is the related notion of cycle. The distinction between the two abstractions can be re-instated if we go on to model the dynamic aspect of the logical grammar -- the control of grammar re-entry -- not as part of the static system potential but as part of the generation algorithm itself. That would mean that the generation algoritm would handle all cases of grammar re-entry. The type of grammar re-entry discussed in Section II:1.2.1.6 is automatic: it happens when a preselection or set of preselections has been posted on the agenda of grammatical tasks. The logical type of re-entry is, as already emphasized, a matter of choice: it is non-constructional.

Let's now consider the logical resources of clause complexing. I might treat them in the same way as I handled secondary tense --

[3] Features might be passed down the interdependency chain but they would always be passed to the current Dependent. The same is true of structural ellipsis in the context of parataxis: it applies to the current Initiating or the current Continuing link.

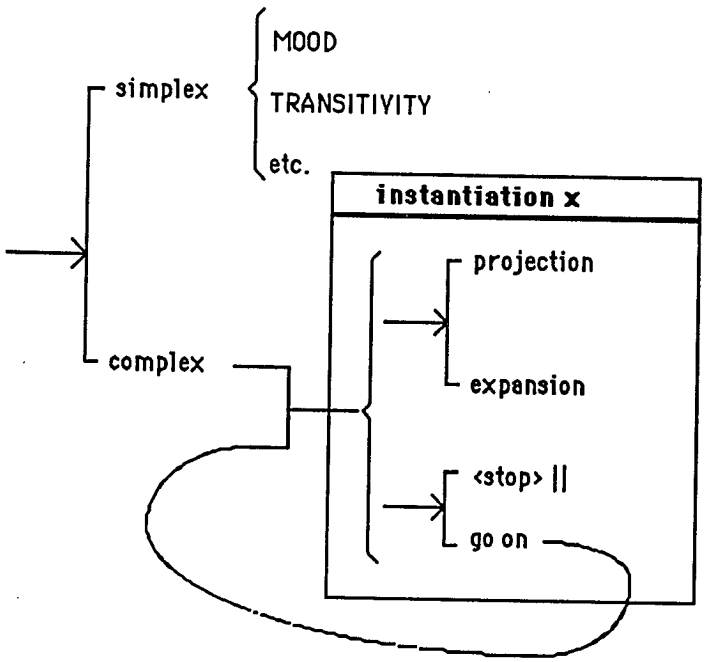


Fig. II:3.2-36: The logic of clause complexing (1)

However, the sketch drawn for secondary tense has two shortcomings when we turn to clause complexing; I will explore them in the context of an example. Halliday (1985, Disc on disc) discusses the following clause complex:

> I had to wait -- I had to wait till it was born, and till it got to about eight or ten weeks of age, then I bought my first dachshund, a black-and-tan bitch puppy, as they told me I should've bought a bitch puppy to start off with, because if she wasn't a hundred percent good I could choose a top champion dog to mate her to, and then produce something that was good, which would be in my own kennel prefix.

He gives it the following logical analysis of the clause complex.

1 1	I had to wait
1 2 α	I had to wait
1 2 β 1	<u>till</u> it was born,
1 2 β 2	<u>and till</u> it got to about eight or ten weeks of age
2 α	<u>then</u> I bought my first dachshund, a black-and-tan bitch puppy,
2 β α	<u>as</u> they told me
2 β β α α	I should've bought a bitch puppy
2 β β α β	<u>to</u> start off with,
2 β β β α 1 α	<u>because</u> <...
2 β β β β	<u>if</u> she wasn't 100% good >
	I could choose a top champion dog,
2 β β β α 1 β	<u>to</u> mate her to,
2 β β β α 2 α	<u>and then</u> produce something that was good,
2 β β β α 2 β	<u>which</u> would be in my own kennel prefix.

Halliday sketches the construction of the clause complex as follows:

> The clauses that go to make up a clause complex such as this one are not embedded one inside another. The speaker does not construct a mental plan of the grammar in advance, like a completed architectural drawing; rather, he sets out on a journey, and each lap of the journey takes him to a point from where he can set out again. One lap may be dependent on another, in the sense that he sets out for point (a) because this is a good way of getting to point (b); but each lap is a distinctive stage in his progress. The grammar (that is, the model of grammar) that is used for interpreting casual conversation need to represent the clause complex in this fashion, rather than as a static edifice of structural constituents.

The example and Halliday's interpretation of it suggest that there are two ways in which the type of account given for secondary tense has to be extended to

deal with clause complexes (and other complexes; clause complexes constitute the biggest challenge):

(i) In addition to linear development, there may be layering (internal nesting).

(ii) Parts of the complex may be developed before the whole complex has been developed.

(i) In addition to the linear development of the logical organization, there may be internal nesting; for instance, the first initiating element is organized internally as 1 2α 2β1 2β2, or, with brackets, 1 2(α β(1 2)). In the discussion of secondary tense, I only allowed for the linear development: the option of going on is interpreted as going on linearly, at the same level of nesting.

It is possible, of course, to achieve the internal nesting by means of ordinary recursion: each element in the structure of the clause complex is then developed by re-entering the grammar in ordinary fashion and choosing either 'simplex' or 'complex'.

This approach would work, up to a point. However, it misses the essential character of the way in which a clause complex unfolds, captured in Halliday's metaphor of the unfolding journey. Ordinary recursion is a rank-based phenomenon: while it entails a descent in rank, linear recursion does not.

(ii) It is unlikely that the generation is sequenced in such a way that the entire structure for the clause complex is developed before any simple clauses are produced; rather, the development of the clause complex and the development of its clauses must be interleaved. In the discussion of secondary tense, I did not take into account the possibility of interleaving.

3.2.4.7 Summary

Logical grammar includes both logical structure -- relational interdependency structure -- and logical systems -- recursive systems. Both of these aspects of logical organization fall outside the baseline Nigel grammar. I have shown how and have discussed various ways of incorporating logical grammar. The discussion in not conclusive; logical grammar is very much at the edge of the implementation of grammatical theory. Logical grammar is interesting from a methodological point of view; within the study of grammar itself, it raises the kinds of issues of dynamic modelling that are an inherent part of the task of text generation.

From § 3.2.4.4: Let's now take a closer look at the interdependency operators. Three types are tabulated below -- insertion, preselection, and ordering.

	Constituency	Interdependency
insertion	Insert as constituent	Insert as interdependent 'next'
preselection	Preselect at rank below	Preselect 'next' with option to push if paratactic
ordering	Order any two constituents	Order interdependency pair

Fig. II:3.2-37: Interpretation of insertion & co. with constituency and interdependency

The basic difference between constituency and interdependency lies with the insertion of a function.

	Constituency	Interdependency	
		parataxis	hypotaxis
insertion	+ X	$X_I \rightarrow + X_{II}$	$X_I \searrow + X_{II}$
preselection	X: m	X: m => X_I: m X_{II}: m ('transitive')	X: m => X_I: m ('non-trans.)
ordering	X ^ Y	(automatic: $X_I \rightarrow X_{II}$)	default: $X_I \searrow X_{II}$ (progressive) $\searrow X_{II}$ X_I (regressive)

Fig. II:3.2-38: Realization statement and constituency vs. interdependency

3.2.5 Interpersonal grammar

I will now turn to representational issues that derive from the interpersonal organization of grammar.

3.2.5.1 The nature of interpersonal grammar

Interpersonal grammar is the resource for establishing and maintaining the relationship and interaction between speaker and hearer, including attitudes given and demanded as well as speech functions. As was mentioned above, there are two high-ranking origins of interpersonal systems:

(i) the information unit, realized by the tone group; and

(ii) the clause.

Examples of interpersonal resources include

information unit	KEY
clause	MOOD & MOOD TAG POLARITY MODALITY REFLEXIVIZATION

Fig. II:3.2.5-1: Interpersonal resources

These systems *interact* in various ways with one another; these interactions constitute one type of evidence of common interpersonal origin of the systems and I will point to a few brief examples.

(i) **MOODTAG** is the resource for eliciting a response from the listener for those mood selections not requiring verbal responses, i.e., for declaratives and imperatives. (The request for a verbal response is, of course, embodied in interrogatives.) Declarative and imperative clauses are directly arguable; they are open to agreement, disagreement, compliance, rejection, and so on. This is reflected in the MOOD TAG resource. If we select to tag the clause, we ask the listener to address the arguability of the clause. The nature of this request depends on the MOOD selection: if the clause is declarative, we may request an expression of agreement. In the following example, MOOD (selection: declarative in INDICATIVE TYPE), POLARITY (positive), and TAG (selection: tagged) combine to express an assertion requesting a confirmation:

A: He brings in every argument from every field of activity under the sun. <u>You've</u> heard him on this, <u>haven't you</u>?

B: Yes, yes, yes, yes. (CEC)

If the clause is imperative, we may request an expression of willingness to comply:

Hand me my glasses, will you?

(ii) **POLARITY**, the choice between positive and negative, is interpersonal in that it represents the speaker's denial or affirmation, agreement or

disagreement, command or prohibition, etc. with respect to a proposition/proposal. Since they are both interpersonal resources, MOOD and POLARITY can combine to form interpersonal categories. The features yes/no interrogative (MOOD) and negative (POLARITY) together define the category of 'non-assertive'; cf. Quirk et al. (1972: 54). In general, MOOD and POLARITY together express speech functional categories such as denial (declarative & negative), contradiction (declarative + polarity reversed from the original claim), and prohibition (imperative + negative). For further discussion of 'negation' and speech function, see e.g. Givón (1979).[1]

Furthermore, the reason for choosing negative POLARITY depends on the MOOD context in which the choice is made. If the context is yes/no (polarity) interrogative, there is a special reason; in other MOOD contexts, the issue is whether a negative polarity value is to be expressed or not. When the clause is a yes/no interrogative one, the issue is whether the speaker wants to express a positive expectation as to the value of the polarity, in which case, negative is chosen, or whether he / she wants to remain neutral, in which case, positive is chosen.[2] For instance, in the first of the following examples, A says something like 'I expect it is Peel ... don't you agree?' by choosing negative polarity in the yes/no interrogative:

A: Isn't it Peel who's always having rows with Doyen? 'I think it is Peel'
B: I don't know what he is doing now, but he was always very colourful. ...(CEC 171)

A: "I take care of all the playthings that children have

[1] Polarity is interpersonal rather than logical. Propositional logic might suggest that negation groups with conjunction and disjunction as logical (cf. the assignment of it in Halliday, 1968: 202). But negation per se is not a functional domain (as Givón, 1984, claims); prefixal negation at word rank is different from the clause system.

[2] Cf. Bolinger (1957) on conducive questions.

loved. When they are old and worn out and the children don't need them anymore, I come and take them away with me and turn them into Real."
B: "Wasn't I real before?" asked the little Rabbit. 'I thought I was' (MW)

(iii) **MODALITY** complements POLARITY in being the scale of assessment between positive and negative: 'certainly', 'probably', 'maybe', and so on. There are two basic kinds of modality, which reflect a basic distinction underlying the categories of mood in English, viz. the distinction between information, reflected in the indicative mood, and action to exchange goods & services, reflected in the imperative mood: one type of modality is concerned with the assessment of the probability or usuality of the information and the other type is concerned with volitional or deontic constraints on the occurrence of action.

Like POLARITY, MODALITY interacts with MOOD. The MOOD context affects the orientation of a modal selection. In a declarative clause, the modal choice typically expresses the speaker's angle -- his / her permission or will or assessment of possibility -- but in a yes / no interrogative, the listener's angle is elicited. Thus, for example, *Can I take the car?* means 'will you permit me to take the car?' and the response *Yes you can* means 'yes, I will permit you to take the car'. Furthermore, the distribution of expressions of possibility depends on the mood selection. While possibility can be expressed by either *may* or *can* in a non-yes/no context, only *can* occurs in yes/no interrogative clauses.

The difference in interpersonal function from ideational grammar is reflected in a difference in organization, most clearly in syntagmatic organization. As was mentioned in the introduction, it tends to be prosodic rather than like

experiential constituency (or logical interdependency) structure.

3.2.5.2. Interpersonal syntagmatic organization: prosody

The notion of prosody comes from phonological organization; in particular, it is the prosody of pitch that is relevant, since it serves to express the interpersonal resource of KEY. From the perspective of constituent segments, a prosody is *supra*-segmental; it runs across segments.[3]

Halliday (1979: 67) relates the prosodic mode of organization to the interpersonal metafunction as follows.

> The interpersonal component of meaning is the speaker's ongoing intrusion into the speech situation. It is his perspective on the exchange, his assigning and acting out of roles. Interpersonal meanings cannot easily be expressed as configurations of discrete elements. They may be attached, as connotations, to particular lexical items, like *bastard* above [*Christ they beat the hell out of those bastards*] meaning 'people' plus 'I'm worked up'; but connotations do not enter into constituent-like structural relations. The essence of the meaning potential of this part of the semantic system is that most of the options are associated with the act of meaning as a whole. Even when the meaning is realized in a single word or phrase, this can be interpolated at more or less any point in the clause; and even when two or more such elements are present at the same time, they still do not go together to form constructions.

[3] Interpersonal prosodies are different from the experiential constraints built up for pairs of transitivity functions such as Process + Medium and Process + Range (cf. further Section II:4) in that they have to be stated in terms of interpersonal functions rather than experiential ones if they are to be stated in terms of functions and in that they have wider scope than particular pairs such as Process + Medium.

I will briefly indicate the prosodic nature of the organization of the interpersonal resources discussed above in Section II:3.2.5.1.

(i) Information unit: 'Key'

Let's start with the interpersonal resources of the information unit, i.e. with KEY[4]. It gives a clear example of an interpersonal prosody, since selections are realized prosodically by intonation contours, tones. The following example taken from Halliday (1985: 54) illustrates the principle. The clause is a wh-interrogative one. The information unit selects for 'certain' polarity and the tone group realizing it has tone 1 (falling tone), which is the unmarked tone in the context of wh-interrogatives.

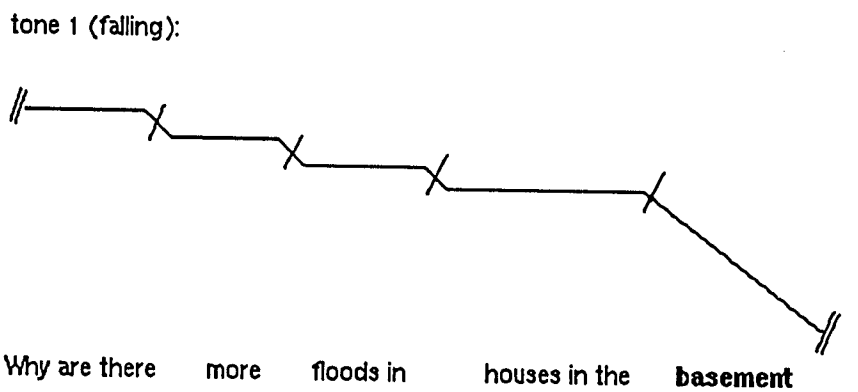


Fig. II:3.2.5-2: Interpersonal prosody

[4] KEY is a resource for expressing variations on the speech functions related to certainty and uncertainty. Or, to be more precise, it is a convenient term for the speech functional categories expressed by tone rather than by mood in spoken English.

The melody runs throughout the tone group realizing the information unit; it is, in other words, a prosody. As a prosody, it contrasts with the experiential constituency of the clause:

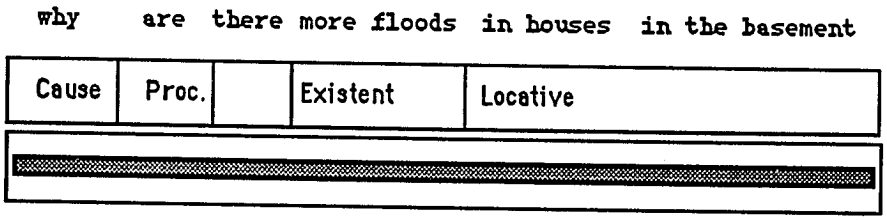


Fig. II:3.2.5-3: Constituency (clause) and prosody (info unit)

(ii) Clause: polarity, etc.

The interpersonal component of the clause is different from that of the information unit in that it is not realized by an intonational prosody; but the mode of expression is still essentially prosodic, which explains why there are representational problems for a grammar like Nigel operating in terms of constituency. Let's look at some interpersonal clause resources.

Polarity

Polarity is similar to key in its prosodic mode of expression. Structurally, it is often not locatable in any one particular place. In "non-standard" English it is often realized wherever possible; the particular transitivity value does not matter:

"I can't go no lower," said the Hatter; "I'm on the floor as it is." (Carroll)

If there wasn't no Federal Government there wouldn't have been no one to fix up any problems that would have occurred in the community. (Student essay, quoted in Martin & Peters, 1985)

I ain't never had no trouble with none of 'em (from Labov, 1970)

"Standard" English is of course quite similar in this respect. The difference is that the pattern is not *not ... never no none* as in the example above but rather *not ... ever any any* with so-called non-assertive polarity items following *not.* The prosodic character remains; the "non-assertive" forms are typically used wherever possible. Diagrammatically, the polarity prosody can be represented in the same way as the mood person & number prosody:

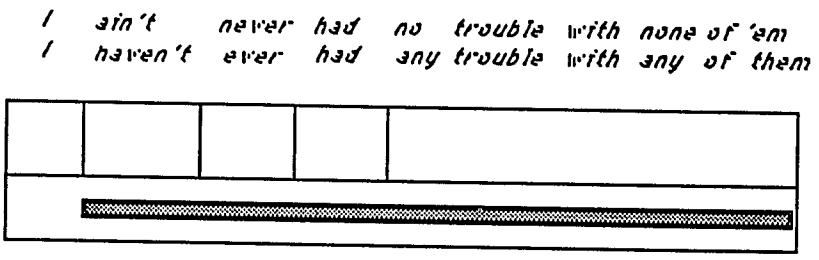


Fig. II:3.2.5-4: Polarity prosody

Just as before there is no formal representation of the prosody, no realization operator that can be used. And just as before this is to be expected since the realization operators are constituency-oriented rather than prosody-oriented.

Modality

MODALITY is again similar. A modal selection characterizes the clause as a whole and may be realized by a modal auxiliary, a modal adjunct, and a form such as *I think*;[5] these may be used individually, as in the following example of a disagreement:

A: Oh, well. That's *surely* debatable.

B: I *don't think* it's debatable. No. (CEC 443)

Or they may be used together creating a modal prosody as in

A: No, I only meant that maps must have existed.

B: Oh, maps *must* have existed, *certainly*.(CEC 441)

He *could* have produced them from scratch *presumably*.(CEC 450)

No. I *think probably* there *might* be lots of copies of texts.(CEC 809)

Reflexivization

Reflexivization also seems to work as a prosody. Whenever appropriate, a constituent following the interpersonal function Subject of a clause is marked for identity of reference:

[5] Forms such as *I think, I believe,* and *I suppose* are instances of interpersonal metaphors of modality (Halliday, 1985: Section 10.4); cf. Section II:3.3 below. These metaphors serve to increase the potential for interpersonal prosodies, as in the following example quoted below: *I think probably there might be lots of copies of texts.*

Henry talked about himself to himself often in those days of intense loneliness

The particular value in the transitivity structure of the constituent reflexivized (Goal, Actor, Recipient, etc.) does not matter; what matters is whether the reflexive prosody runs through it or not and whether it can expound the reflexive prosody or not. Again, the formal problems in a treatment of reflexivization can be predicted from its prosodic nature. There is no easy way to use the Preselect operator to achieve reflexivization wherever appropriate.

Mood person & number: Subject - Finite agreement

Agreement is prosodic. If it is stated in terms of constituency, it typically has to be characterized as running across more than one constituent just as e.g. nasality may run across several phonological segments. Agreement between Subject and Finite is a case in point. It is, as already suggested, a mood characteristic rather than a Subject property or a Finite property per se, since it runs across these two constituents. We can thus speak of Mood number and Mood person rather than only Subject number and Subject person.

Moodtag

Mood number and person and moodtag are closely related. If a moodtag is present, as in *You are coming out tonight, aren't you?*, the person and number selections run through both the mood and the moodtag. This prosody is

represented diagrammatically below:

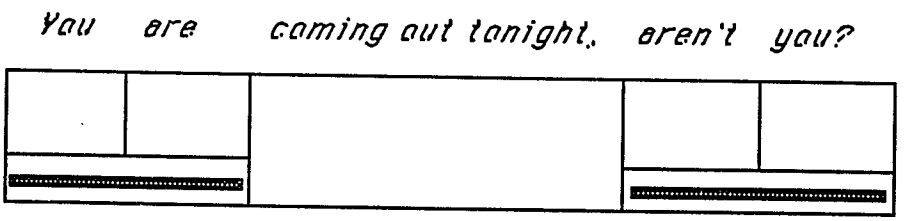


Fig. II:3.2.5-5: Mood and moodtag - number & person prosody

To sum up, interpersonal resources such as KEY, POLARITY, and MODALITY are realized prosodically or have the potential to be realized prosodically.

~*~*~*~

Prosody and interdependency

The prosodic mode of expression contrasts with the interdependency structure generated by logical resources such as TENSE. Interpersonal sequences such as *n't ... never ... no ... none, n't ... ever ... any ... any,* and *I think ... probably ... might* may look superficially similar to a logical sequence such as *will ... have ... been going ... to build;* but they are built on quite different principles. The first is a prosody and is an ongoing realization of the same selection (negative and possibility, respectively, in the examples). The second is a logical interdependency structure and is a repeated realization of repeated selections.

There are a number of specific consequences of these differences.

(i) Since the prosody reflects one selection, it need not be present as a whole to express it as long as the negative item associated with Finite is present:

I haven't always had the same trouble with all of them

Conversely, the expression of the prosody may be further extended without additional polarity choices in the clause:

I haven't *ever* had *any* trouble with *any* of them, in *any* way, *anywhere* we've worked together

In contrast, the tense selection underlying *will ... have ... been going ... to build* can only be expressed by the whole chain; and we could only add links if we made additional tense selections.

(ii) While the items in the negative prosody are not dependent on one another, either in terms of form or constraints on the range of alternatives, the verbs in the logical interdependency chain are dependent on one another; the form of each new verb expanding the tense series is determined by the previous choice.

(iii) Moreover, since the polarity items in *I haven't ever had any trouble with any of them* are not ordered logically, their relative sequence is not fixed. For example, the temporal adjunct can be thematized, with the concomitant reversal of Subject and Finite typical of clauses with negative themes (where the negativity is a feature of the clause rather than the thematic constituent alone):

Never have I had *any* trouble with *any* of them

Again, logical structures are different; for example, the sequence in *will ... have ... been going ... to build* reflects the logical ordering of the tense series and cannot normally be changed.

3.2.5.3 Representational problems and solutions

None of the existing realization operators can achieve more formally what is represented diagrammatically as prosodies above. Features can only be manipulated as segments associated with constituent functions; they cannot be introduced as prosodies. I will explore the following aspects of representational problems and solutions:

(i) Prosody in constituency terms,
(ii) Preselection in constituency terms: 'vertical',
(iii) Preselection across constituents: 'horizontal', and
(iv) Semantic control: preselection from above.

Let's start with the notion of constituency: the representational problems with prosodic organization are brought out when we try to capture the prosodies in constituency terms.

(i) Interpersonal constituency; representation of prosody by constituency: Expand

In certain respects, the clause as an interpersonal unit -- the clause as exchange / interaction -- is organized on the model of constituency: the clause has a Mood constituent, consisting of Subject, Finite, and possibly Wh and certain interpersonal assessments. Mood may be picked up again later in the Moodtag, consisting of Tagfinite and Tagsubject (example from CEC, 63):

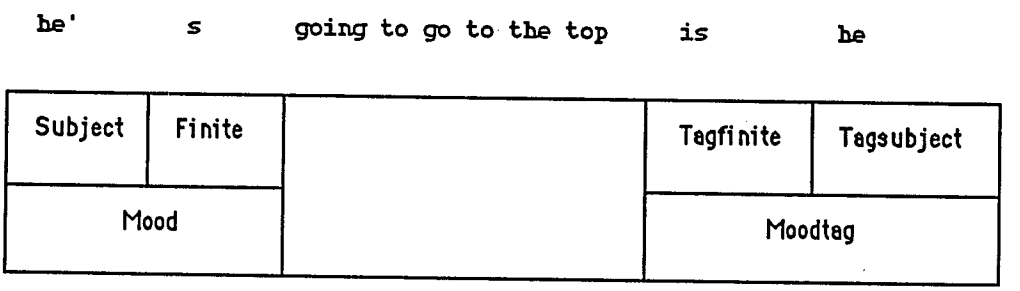


Fig. II:3.2.5-6: Mood and Moodtag constituents

The Mood constituent embodies the MOOD selection in the clause (declarative ↘ Subject ^ Finite, wh- ↘ Wh ^ Finite, yes/no- ↘ Finite ^ Subject, etc.). It is the constituent of arguability; for example (the Mood through which the argument runs is in bold):

"I'm a poor man," the Hatter went on, "and most things twinkled after that - only **the March Hare said** - "
"I didn't!" the March Hare interrupted in a great hurry.
"You did!" said the Hatter.
"I deny it!" said the March Hare. (Carroll)

One of its subconstituents, Subject, is the interpersonal 'interface' to experiential TRANSITIVITY as well as textual THEME. While Mood and Moodtag are clearly constituents of the clause, they also reflect the prosodic nature of interpersonal organization, as has already been noted: mood person & number run through them both (cf. Figure II:3.2.5-5 above).

Halliday has introduced the interpersonal constituency interpretation of the clause in terms of Mood and Moodtag. But he has taken the constituency interpretation one step further. This is the Mood ^ Residue structuring. Residue is in principle what is not included in the Mood constituent, viz. Predicator, Complements, and Adjuncts that are not part of the Mood. Our previous example has a Residue consisting of Predicator and Adjunct:

he' s going to go to the top is he

Subject	Finite	Predicator	Adjunct	Tagfinite	Tagsubject
Mood		Residue		Moodtag	

Fig. II:3.2.5-7: Residue as a further interpersonal constituent

There is only one Predicator, but there may be more than one Complement and more than one Adjunct. A Complement is always conflated with a participant function from the experiential transitivity structure of the clause and an adjunct may be conflated with a circumstance. Different complements and different circumstantial adjuncts are neither multivariate nor univariate in the

way experiential functions are multivariate and logical functions are univariate.

(i) Different complements are not interpersonally distinct, as they would be if they were multivariate. The same is true of different circumstantial adjuncts. The only interpersonal distinction is (actual) Subject vs. potential Subject (Complement) vs. not potential Subject (Adjunct).

(ii) Complement and Adjunct are not univariate functions. The possibility of having more than one Complement and more than one circumstantial Adjunct is not a case of logical recursion. There is no system such that we can make repeated selections of 'complement' or 'adjunct'. The number of Complements and circumstantial Adjuncts is completely determined by the experiential organization of the clause. Since Complement and Adjunct are not univariate functions, it is not clear how multiple complements or adjuncts should be kept distinct in the clause in generation.

The fact that Complement and Adjunct are neither really multivariate nor univariate may be taken to suggest that they are prosodic rather than particulate: a non-subject participant or circumstance would then be complement or adjunct, but these would be prosodies rather than sets of distinct constituent functions. I won't pursue the question any further here.

The interpersonal constituents Mood, Residue, and Moodtag can be used in stating the domains of the interpersonal prosodies, the domains of person & number, polarity, etc. This possibility is illustrated in the diagrams below, first for the example from Fig. II:3.2.5-4 above and then for an example also involving reflexivization.

(a) *I haven't ever had any trouble with any of them*

Subj.	Finite: negative	Ajdunct	Pred.	Complement
Mood		Residue: non-assertive		

(b) *I haven't ever asked myself any hard questions*

Subj.	Finite: negative	Adjunct	Predicator	Complement	Complement
Mood: speaker		Residue: reflexive, non-assertive			

Fig. II:3.2.5-8: Prosodic organization and constituency

The features 'speaker', 'reflexive', and 'non-assertive' have been associated with the Mood and Residue functions, not with the functions that are directly realized by groups (Adjunct, Complement, etc.), to indicate their domains in constituency terms. (I use the feature 'non-assertive' in the way it is used by Quirk et al.; cf. Figure II:1.2-14 in the discussion of gates.)

This approach could be a constituency solution to the problem of representing grammatical prosodies. However, there is no formal correlate of the diagram cast in terms of current Nigel realization operators. Presently, the Preselect operator can only be used to associate a feature with a grammatical function that is directly realized by the grammar, but both Mood and Residue are further expanded rather than directly realized. This might be addressed by defining a convention for propagating features associated with expanded functions to its

expanding functions: if α is the set of preselected features associated with M, i.e. M:α , and D is a function expanding M, then the expansion M (D) will also lead to the propagation of the preselected features D: α , i.e.:

$$M: \alpha , M (D) \Rightarrow D: \alpha$$

For instance, the feature 'non-assertive' would be propagated from Residue to the expanding functions Adjunct and Complement, Residue: non-assertive, Residue (Adjunct, Complement) => Adjunct: non-assertive, Complement: non-assertive, as in *I haven't ever had any trouble with any of them:*

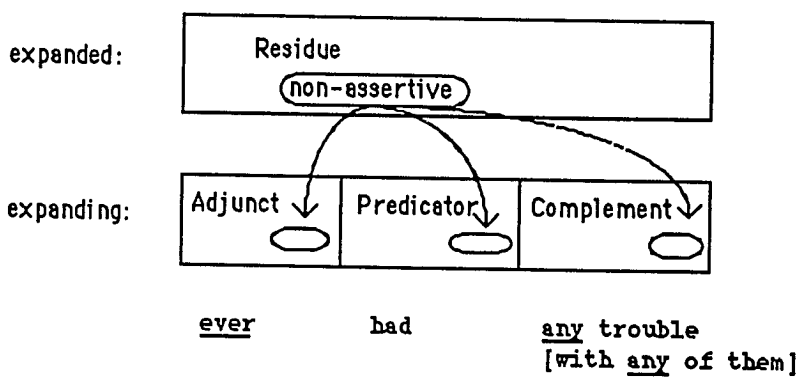


Fig. II:3.2.5-9: Feature propagation through expansion

However, a number of issues would have to be addressed. The diagram presupposes a knowledgeable procedure of feature distribution to be activated where appropriate. For example, the feature 'non-assertive' should only be applied to adverbial and nominal groups that realize functions expanding Residue, not to verbal groups. Another issue is that the propagation does not end with the functions expanding Residue. The nominal group of the phrasal

postmodifier of the nominal group realizing Complement is also affected.

Furthermore, the feature 'reflexive' would not behave like other features. It really means something like "check to see whether the nominal group is coreferential with the Subject; if it is, choose 'reflexive' in that group". And just as with the feature 'non-assertive', there is the issue of appropriate applicability.

I will use MOOD PERSON and NUMBER as a further simple illustration of the problems in representing prosody. So, the initial question is how agreement can be achieved in the current Nigel grammar.

(ii) Preselection in constituency terms: 'vertical' preselection

We can achieve agreement by preselecting both Subject and Finite in the clause directly without the intermediate step of preselecting Mood. For example, we can set up the MOOD PERSON and NUMBER systems for indicative clauses shown below together with preselections.

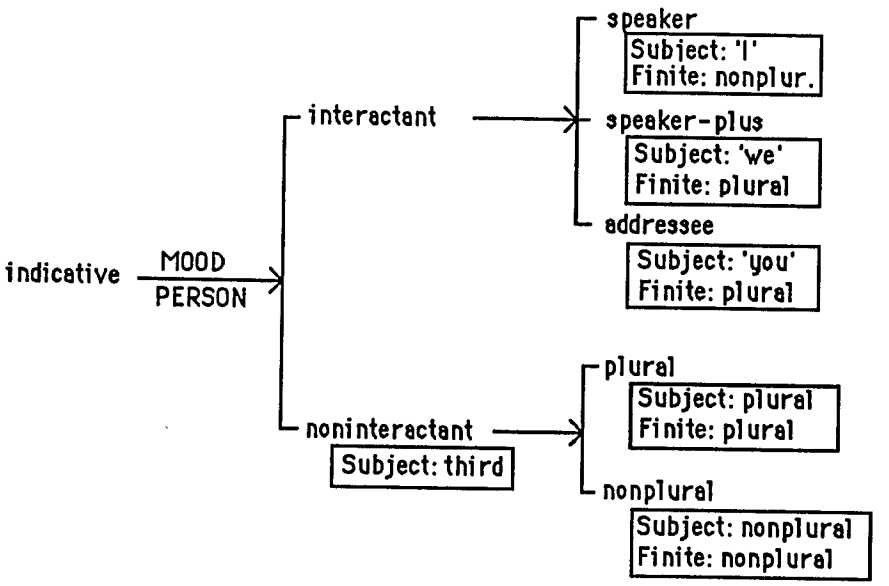


Fig. II:3.2.5-10: MOOD PERSON -- preselections of Subject and Finite

The main problem with this approach to the representation of agreement is one of anticipation. It is important to emphasize that the "agreement" between Subject and Finite is a clause phenomenon. Its existence and characteristics are interpretable in terms of the mood organization of the clause, Mood (Subject, Finite). However, the fact that its existence is a clause phenomenon does not entail that the various person and number values necessarily have to be anticipated in the clause.

The problem with anticipating the number values is that plurality can be achieved in a number of different ways by nominal groups. We have what we may call additive plurality, plurality in disjunction, multiplicative plurality, and collective plurality, for example:

```
The title and (the) purport are ...
The title or subtitles are ...
The titles are ...
The crew are ...
```

If Subject is preselected to be plural, i.e., Subject: plural, this feature can be instantiated in the nominal group in at least the four different ways exemplified above.

(iii) 'Horizontal' preselection

Instead of trying to anticipate the different kinds of nominal group plurality in the clause, it seems preferable to adopt a solution like the following.

(1) Specify in a realization statement in the clause that Subject and Finite are the same in person and number, but don't anticipate the various possible values.

(2) Let the values be determined across constituents so that the nominal group choices of person and number values (Subject) determine verbal group choices (Finite).

An approach like this seems obvious enough as one possible solution. The point here is that it requires new "realization machinery". For the first step, we need to be able to state the identity, say:

Finite: [PERSON = PERSON (Subject)]

(or, more generally:

$Function_1$: [SYSTEM = SYSTEM ($Function_2$)])

which means that the PERSON system in the verbal group realizing Finite has the same value as the PERSON system in the nominal group realizing Subject. For the second step, we need to allow the choice of a feature in one system to be made according to the choice of a feature in another system. In other words, we have to allow the method of choosing to be predetermined in this case, not the particular feature value.

Nothing like the procedure sketched above exists for Nigel at present. However, something like it is supported by Functional Unification Grammar; see Kasper (1988).

There are a number of problems with the approach. One drawback with a statement of the form $Function_1$: [SYSTEM = SYSTEM ($Function_2$)] is that it has to be repeated for every function to be affected by the preselection. Furthermore, it may not be possible to anticipate all the contexts affected by the preselection: this is the case with the polarity prosody; cf. the discussion in (i) above. Another potential drawback is that the same systems have to be used for different types of group so as to support the 'equation', which is a problem in a single network grammar (cf. Section II:1.2.1.4).

(iv) Control from above: semantic preselection

Clearly, there are other possible solutions to the "agreement problem". For instance, instead of having the grammar ensure agreement through some kind of realization statement, we can rely on semantic/conceptual consistency and make the person-number choices twice, once for the Subject nominal group and once for the Finite constituent (cf. Section III:2.4 (iv) below). Agreement will then obtain simply because the two sets of choices will be guided by the same information. For example, the referent of the Subject of *King Arthur and his knights are valiant* , 'King Arthur and his knights' will determine both the person and number of the nominal group complex *King Arthur and his knights* and the form of the finite verb *are.* This is the kind of approach to "agreement" used in Nigel at present.

(v) Prosodies as separate channel

Finally, let's consider briefly the possibility of representing an interpersonal prosody in its own terms. We can return to the notion introduced above in Section II:3.2.1 of metafunctions being organized into separate channels. For example, in the constituency interpretation, Residue is a constituent of clause structure. Alternatively, we can think of it as a channel for prosodic information. The availability of this information is determined by the extent of the channel, not by clause constituency. Interpersonal choices can be realized by specifications posted in this channel and these specifications are available as long as the channel is open. Consequently, a specification for negative polarity can be instantiated as long as the channel is open.

3.2.5.4 Interpersonal systems

Interpersonal systems of MOOD, MODALITY, POLARITY, etc. are unproblematic: they take the same form as experiential systems. There are representational issues to be addressed in the area of interpersonal metaphor, but I will postpone these until the general discussion of grammatical metaphor in Section II: 3.3.

One general representational issue that does arise in the interpersonal component is how to deal systemically with attitude and comment. This issue is particularly relevant to the treatment of lexis in lexicogrammar, so I will postpone the discussion of it until Section II: 4.

3.2.5.5 Summary

In the discussion of interpersonal grammar, I have focussed on its prosodic mode of expression of polarity and other meanings. This mode of expression is problematic for a grammar based solely on constituency, just as it is for a purely segmental phonology. We can try to represent prosodies in constituency terms and this will work up to a point; but we need to explore other ways of dealing with prosodies. I have briefly discussed a number of alternative approaches.

3.2.6 Textual grammar

I have looked at the logical and interpersonal modes of organization and considered how they help explain representational issues in the current baseline Nigel grammar. I will now turn to the last metafunction, the textual one, and explore the issues it raises for the Nigel grammar.

3.2.6.1. Textual resources

Textual grammar provides the speaker with the resources for *contextualizing* the ideational and interpersonal meanings -- giving a message or a part of a message a status as given or new, elaborating or contrasting, identifiable or nonidentifiable, and so on.

3.2.6.1.1 INFORMATION and THEME

Here I will concentrate on the textual resource of the information unit, INFORMATION, and the textual resource of the clause that creates textual structure, THEME:

information unit	INFORMATION
clause	THEME

Fig. II:3.2.6-1: Textual resources of the information unit and the clause

THEME is concerned with context. (The clause is also the point of origin of the resources of THEME PREDICATION, THEME IDENTIFICATION, CULMINATION, and clausal SUBSTITUTION/ELLIPSIS. I will return to these systems below.) While all clauses occur in context, THEME is the resource for manipulating the contextualization of the clause; it is the resource for setting up a local context for each clause in a text, its "point of departure", as Halliday puts it. The thematic context may itself be ideational (for example, a circumstance of time or space), interpersonal (for example, the modal value of the clause), or textual (the conjunctive relationship to preceding text); or a combination:[1]

ideational: Carefully fold in egg whites and set the batter aside. (Cadwallader)

interpersonal: Regrettably, that kind of attitude has not been limited to the Reagan administration. (LAT)
Sometimes they need to have water added, so check the pot periodically. (Cadwallader)

textual: Next add oil, salt, and the remaining 3 cups of whole-wheat flour. (Cadwallader)

[1] The multi-functional spectrum of possible themes has sometimes been missed, because Theme has been interpreted too narrowly as 'topic'. But 'topic' is only one type of theme, viz. ideational theme, perhaps participant themes in particular.

textual + ideational: Meanwhile, with a blender or beater, mix: (Cadwallader)

interpersonal + ideational: Maybe someday you'll go to Egypt and see them. (Rocks)

Often, a clause is contextualized by indexing into the method by which the text is developed; see Fries (1983). For instance, the following span of text is developed rhetorically by means of contrast and the themes have been selected to identify the points of contrast.

> In his mind he is another "Carlos the Jackal," the international terrorist who has kidnapped, killed and still runs free. But in reality Mehmet Ali Agca, the man who shot the pope, now lives isolated under close surveillance in Ascoli Piceno Prison outside Rome. (Newsweek, 20/vi/83)

I will return to the contribution the thematic resources make to the development of text in Section IV:3.

INFORMATION is concerned with newsworthiness: it is the resource for guiding the listener to attend to what is presented as news and non-recoverable and what is presented as given and recoverable. INFORMATION is a system of the information unit, which is realized phonologically by the tone group. As noted in Section II:3.2.1, the information unit and the clause need not be coextensive. As an illustration of information structuring, consider the following example, where the listener is given news prominence as the recipient in the last information unit:

> // In **fact** // it was **very** shortly // **after** that // **interview** // that I sent my circular letter **around** to various scholars // and I sent **you** a copy// (CEC, p. 376)

It contrasts with the following example, where it is not the recipient that is the news but that which is received:

// That gives them **time** // you **see** // to give me an **answer** // (CEC, p. 389)

Since both are textual resources, THEME and INFORMATION interact in various ways. The Theme tends to fall within the non-news, given, part of the information unit. Conversely, the New tends to fall within the non-thematic, rhematic, part of the clause. Furthermore, marked themes often constitute separate information units, as in the following clause that corresponds to two information units, one for the marked Theme (underlined) and one for the Rheme:

//<u>but **officially**</u> // he never changed his **mind** // (CEC, p. 159)

3.2.6.1.2 Principles of textual organization; second order nature

I suggested at the beginning of this section (in II:3.2.1) that representational problems in the textual area can be understood and analysed in the light of the textual 'pulse' in the information unit alongside the clause. This is one of two principles underlying the textual mode of organization that we can use to diagnose representational problems:

(i) 'second order' nature of the textual metafunction; and

(ii) 'pulse'.

I will start by discussing the second order nature of the textual metafunction briefly. Both the ideational metafunction and the interpersonal one relate to 'realities' that lie outside language, viz. to the reality of our experience of the world and the reality of interpersonal relationships. We can call these non-symbolic realities outside language first-order categories.[2] The textual metafunction, in contrast to the ideational and interpersonal ones, is inherently linguistic; it exists to enable the creation of ideational and interpersonal meanings:

> From the standpoint of the functions of the linguistic system in relation to some higher-level semiotic that is realized through the *linguistic* semiotic (i.e. 'from above'), it is the textual component that appears as distinct, since the textual component has an enabling function in respect to the other components: language can effectively express ideational and interpersonal meanings only because it can create text. Text is language in operation; and the textual component embodies the semantic systems by means of which text is created. (Halliday, 1978: 130-1)

The 'reality' that the textual metafunction relates to is one that is brought into being by language itself, viz. the mode aspect of context. In this respect, mode is a second-order category, one that exists by virtue of language:

> All the categories [of mode] are second-order categories, in that they are defined by reference to language and depend for their existence on the prior phenomenon of text. It is in this sense that the textual component in the semantic system was said to have an 'enabling' function

[2] The ideational and interpersonal metafunctions create second-order realities as well: ideationally, subject matter is created by text and interpersonally, speech role relations are established between speaker and listener.

> vis-à-vis the other two: it is only through the encoding of semiotic interaction *as text* that the ideational and interpersonal components of meaning can become operational in an environment. (Halliday, 1978: 145)

Within language the textual metafunction itself is a second-order category that exists to enable the first order categories of the ideational and interpersonal metafunctions. This definitely does not mean that the textual metafunction belongs to a post-production department in the process of creating text; second-order does *not* mean secondary. On the contrary, there are often good reasons to see it as driving the other two metafunctions rather than the other way around: it may enable them by organizing them.[3]

The importance of the second order nature of the textual metafunction for present purposes is that ideational and interpersonal organization -- ideational organization in particular -- may be used to achieve textual ends, which explains some representational problems.

I will return to particular examples of how ideational organization is used for textual purposes below, but let me mention the major cases here.

(i) While constituency is not the mode of textual expression, it provides an organization in terms of which patterns of textual prominence can be

[3] For instance, it can be the *raison d'être* for ideational metaphor, as will be illustrated in Section II:3.3. Similarly, while the transitivity organization of the clause in terms of process, participants, and circumstances and the textual organization derive from independent metafunctions, the transitivity organization is, at the same time, textually rational. Halliday (1968: 218) notes: "... the thematic prominence tends to be assigned to the more 'central' among the clause elements, the participants which occupy the active roles in transitivity; and this, together with the opposite tendency in information focus, which favours 'peripheral' elements, especially circumstances, defines in general terms a preferred clause type for transitivity and theme. This is one in which the initiating, often anaphoric, element in the message is the element most closely associated with the process; and the culminating, information-carrying element is that which is most remote." Cf. also Halliday (1985: 149-50).

specified: for instance, once constituents have been created, their sequence can receive textual significance.

(ii) In THEME PREDICATION, A special structure (so-called cleft) *it + be ... that* is created to accommodate the textual metafunction.

(iii) The ideational resources of identifying clauses are used textually in THEME IDENTIFICATION (so-called pseudo-cleft)..

(iv) Ideational and interpersonal structures define the conditions for the textual resource of SUBSTITUTION & ELLIPSIS: once the structures have been created they can be manipulated for textual purposes.

(v) The ideational organization of vocabulary is the basis for the resources of textual cohesion: once the ideational taxonomy of vocabulary has come into existence, movements along it in the course of lexical selection can come to have textual values.

We have then two different modes of using the resources: a first-order mode (ideational and interpersonal) and a second-order mode (textual) that relies on the existence of the resources and assigns values to variants made possible by the existence of the resources (such as variants in sequence and delicacy).[4] We can now turn to the textual pulse.

[4] Natural language would seem to differ in this respect from designed semiotic systems such as symbolic logics for reasoning, where variant equivalent forms are not allowed to carry meaning differences.

3.2.6.2. The textual mode of expression: pulse

Halliday (1979: 69-70) characterizes textual structure as follows:

> The structures that realize options in the textual component are what we may call 'culminative' structures. They are not configurations or clusters of elements such as we find in the ideational component; nor are they prosodic chains of the interpersonal kind. What the textual component does is to express the particular semantic status of elements in the discourse by assigning them to the boundaries; this gives special significance to 'coming first' and 'coming last', and so marks off units of the message as extending from one peak of prominence to the next.

The effect of this is to give periodicity to the discourse. The clause, in its status as message, begins with prominence of one kind, thematic prominence, and ends with prominence of another kind, prominence due to information focus. The latter is expressed through the assignment of the tonic accent to a particular place in the tone group, so the prominence is also in part phonological - and can be heard. The periodicity is further reinforced by the use of conjunctives to link one sentence with another; these contribute to the texture by relating a clause cohesively to what went before, and they also occur at the boundaries - usually at the beginning, but sometimes, especially in casual speech, at the end.

I have called the kind of structure Halliday describes a **pulse** because textual prominence can be thought of as a pulse that ripples through the experiential constituency structure. Halliday calls this kind of structure periodic. The notion can be compared to Pike's (1959) wave.[5]

[5] A pulse has periodicity, of course. I'm not using Pike's notion of wave, however, since he as applied 'grammar as wave' to structures I would interpret as logical interdependency structures rather than textual pulses -- for example, serial constructions, as in Pike (1967).

Pulses do not form hierarchies; the textual metafunction does not generate a constituency hierarchy of themes in the way the experiential metafunction generates a constituency hierarchy of phenomena decomposed into processes, participants, and circumstances, and then e.g. participants in their turn decomposed into things, epithets, etc.. The theme pulse characterizes only clauses, not groups and phrases. Or rather, the pulse is built into the nominal and verbal group structures realized sequentially with a deictic-finite starting point (see Halliday (1977, 1985)), but there is no choice allowing us to 'thematize' different elements of nominal and verbal groups.[6]

To represent textual structure graphically, Halliday uses a diminuendo-crescendo representation. Consider the following conversation, set in Italy. The second turn contains multiple themes:

> A: Do you mean we're overdressed?, said the charming father of the family.
> B: "(Place:) In England, (Time:) at this moment, (Purpose:) for this occasion, we would be quite overdressed." (Spark, p. 28)

Similarly:

> (Time:) In two or more years, (Place:) both in London to which he went for the season and to pay a round of country house visits in the early autumn, and in Paris, where he had settled down, he knew everyone whom a young American could know. (Maugham, p. 11)

The multiple themes can be represented graphically as follows:

[6] This has to be qualified somewhat for the nominal group, since certain modifiers can be expressed by means of pre-modification or post-modification. For instance, possessive modifiers may be Deictic and thus thematic or Qualifier and thus rhematic.

In England, at this moment, for this occasion, we would be quite overdressed.

Place	Time	Purpose	Att-d	Process	Attribute

Fig. II:3.2.6-2: Thematic diminuendo part of the textual pulse – graphic representation

Representation of pulse by constituency: Expand. The thematic pulse affects interpersonal and experiential functions and it can be represented as if it were a constituent function expanded by the functions it affects. We have to treat the non-discrete pulse as if it was a discrete constituent Theme, finding a thematic boundary somewhere (see Halliday, 1985: chapter 3). In addition, we have to give up on representing the dynamic nature of the pulse and its disregard for experiential constituency. The expand operator can be used, Theme (Place) and Theme (Time), giving the following structure:

In England, at this moment, for this occasion, we would be quite overdressed.

Place	Time	Purpose	Att-d	Process	Attribute
Theme					

Fig. II:3.2.6-3: Representation of thematic pulse by constituency

There are at least three important reasons for the pulse metaphor:

(i) The pulse is periodic, with phases of prominence and phases of non-prominence. (There are in fact two pulses, the thematic pulse and the information pulse.)

(ii) The pulse is characterized by gradual transitions rather than sharp constituency boundaries.

(iii) The pulse is dynamic, running across the constituency hierarchy.

The third point in particular explains why textual structuring does not 'respect' the hierarchic constituency organization created by the experiential metafunction.

Let's take INFORMATION first. It shows the principle of the textual independence of experiential constituency structure most clearly, since the information unit, its unit of origin, is simultaneous, but not necessarily coextensive, with the clause: this is the principle of metafunctional differentiation that was introduced above in Section II:3.2.1.

In the **unmarked** case, the assignment of New of the (Given ^) New (^ Given) structure of the information unit can be stated in terms of the constituents of the clause. This is an important principle and may be important in a first approximation of spoken output in text generation. However, in the **marked** case, the clause may be transcended, either (i) because more than one clause falls within one information unit or (ii) because a rank boundary is crossed.

(i) The (Given ^) New (^ Given) structure of the information unit can range over more than one clause; it is not bounded by the clause. For instance (example from CEC, p. 87):

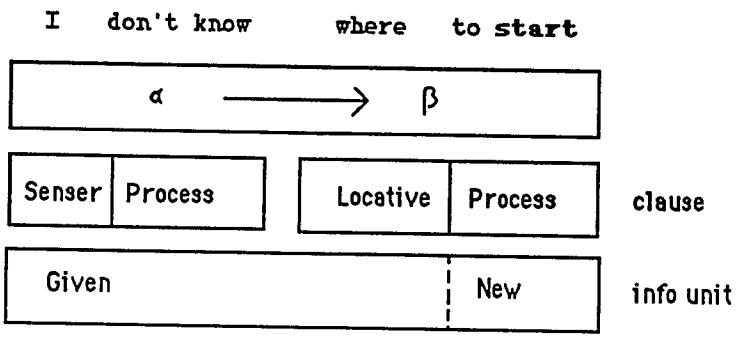


Fig. II:3.2.6-4: New selected independently of clause boundaries

In this example, New includes the clause constituent Process and possibly also constituents to the left of it, the left boundary being indeterminate.

(ii) The selection of New need not respect rank boundaries. In the unmarked case, ranking constituents play a role in the marking of New: the whole group realizing a function in clause structure will be focal if "the tonic prominence falls on the last accented syllable in the entire group", according to Halliday (1977: 185). He contrasts the following two information structurings of the clause *I would as soon live with a pair of unoiled garden shears:*

I would as soon live with a pair of unoiled garden **shears**

I would as soon live with a pair of **unoiled** garden shears

The first illustrates the unmarked case: the tonic prominence falls on *shears,* which is the word with the last accented syllable of the group *a pair of unoiled garden shears* and, as a result, all of the group *a pair of unoiled garden shears* is included. The second is a marked case: *unoiled* precedes the last accented syllable of the group and it alone is focal. A possible analysis is shown below.

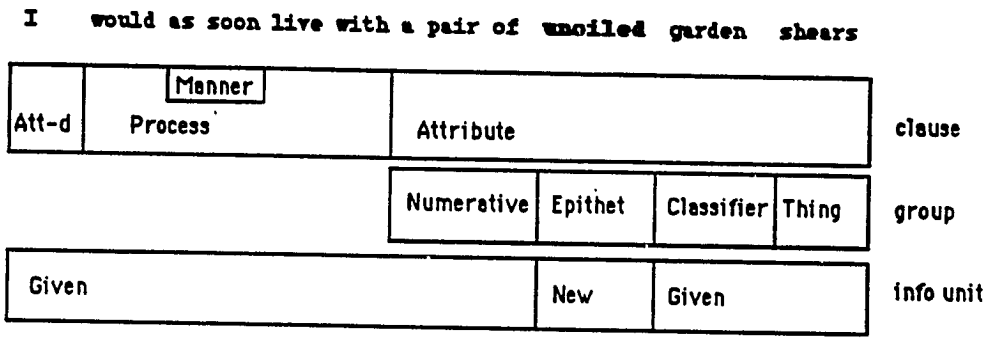


Fig. II:3.2.6-5: The focus of New below clause rank in group

The assignment of New illustrates how the textual metafunction may work independently of the hierarchic organization generated by the experiential one. In particular, the element New of the information unit is not restricted to focus (i) on an element of structure selected from within a single clause; nor (ii) on an element of clause structure. This principle also applies to the assignment of Theme, although to a lesser extent, since THEME is a system of the clause, not of the information unit, and is thus more tightly integrated with other clause systems.

3.2.6.3 Representational problems

The textual independence just mentioned creates problems for a grammar such as the Nigel grammar based on constituency. In principle, it is the marked cases -- marked assignment of Theme and New -- that may create problems since these marked assignments may not be possible to state in terms of the elements of clause structure. Since the current Nigel grammar does not generate spoken output, I will focus on marked themes in the first instance. Marked themes are typically constituents of the clause, but there are certain cases of marked themes that are not clause constituents:

Thematic prominence --*to give marked thematic prominence:*

thematic Minor complement (in prep. phrase)

thematic participant from projected clause

thematic Qualifier of Facet (in nom. gp.)

For instance, the following example has a thematic minor range from the prepositional phrase *in the house:*

<u>This house</u> has not been lived <u>in</u> since the war

In addition, we need to take account of certain cases of constituents that are split into two parts to achieve unmarked status of New:

Information prominence -- *to achieve unmarked information status:*

split participant (as Subject or Complement)

split Process

For instance, the following example has a nominal group split into head and postmodifier:

Petitions were afloat that she be locked up

Both thematic prominence and information prominence may thus lead to *discontinuity* in terms of the constituency structure[7] and discontinuity constitutes a representational problem. I will start by discussing thematic prominence in Section II:3.2.6.3.1 and will then turn to information prominence in Section II:3.2.6.3.2.

3.2.6.3.1 Thematic prominence: theme selection outside clause

After characterizing thematic prominence (Section II:3.2.6.3.1.1), I will suggest that problems arise when an ambivalence in the grammar (see below) makes it possible to select a theme from outside the clause in which the theme operates (Section II:3.2.6.3.1.2); the grammatical ambivalence concerns the interpretation of what constitutes an element of the clause. I will then survey the problem cases and discuss solutions (Section II:3.2.6.3.1.3).

[7] As a result of the textually motivated discontinuity, a constituent may often be 'distributed' both early and late in the clause, giving it thematic prominence as well as potential prominence as news. (The prominence is only potential, since the 'late' part may be a preposition, which will typically be given, coming after the New element: What have you come for?)

3.2.6.3.1.1 General characterization

Although THEME is different from INFORMATION in that it is a clause system, there are important similarities: in particular, certain marked theme selections may go beyond the clause, just as certain marked selections of New may. This is unproblematic from a representational point of view as long as the theme is related cohesively; but problems arise when it is integrated structurally. It is important to see these two cases as aspects of the same type of phenomenon; in particular, it is helpful to see the problematic cases of structural integration against the background of cohesively related themes, so I will start with cohesively related themes.

(i) Cohesively related themes

In the limiting case, Theme is not integrated *structurally* with constituents of experiential structure but rather through the textual cohesive relation, typically reference; it is independent of ideational structure. This happens when the Theme is specified by means of internal subject matter (marked by *as for, as to, as regards,* etc. in writing and often left unmarked in speech, in which case it has been called left dislocation); e.g.:

> As for the opposition, *this* amounted in the first instance to demands (inspired by Gandhi) that we leave India "to God or to anarchy" or alternatively were challenged to hold it against a massive campaign of "non-violent non-co-operation", which meant in effect that the native population would go on strike and in no way assist us to maintain the country as a going concern from which we could train, equip, supply and launch an army to chuck the Jap out of the Eastern archipelago! (Scott, The Jewel in the Crown, p. 305)

As for Stoppard, *he* has taken the play's acclaim in cautious stride. (Time, 16/i/84)

In these examples, the Subject is coreferential with the marked Theme: this is how the referent of the Subject can be given marked thematic status. The second example above is represented diagrammatically below:

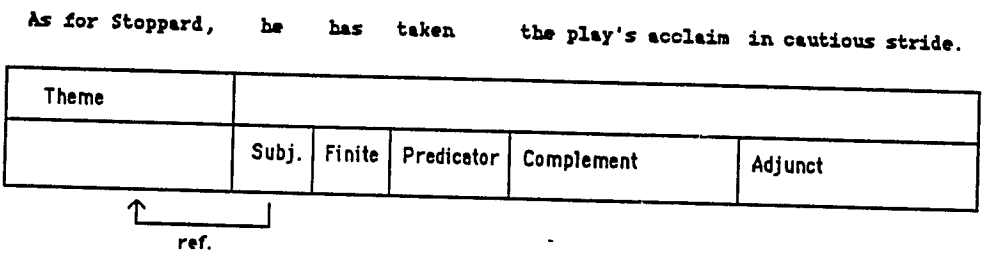


Fig. II:3.2.6-6: Theme related to Subject non-structurally, through reference

Since the relationship is cohesive rather than structural, the Theme may be picked up by means of reference outside of the clause in which it appears. That is, the thematic unit extends beyond one clause. For instance, in the following examples, the Themes *as for the tough-guy image* in the first example and *as for the tense forms of natural languages* in the second example appear in projecting clauses and are picked up referentially in the clauses they project:

Gallagher effectively shatters the twin images of Ford the tough guy, tyrant at home and on the set, and of Ford the semi-literate poet, like Johnson's Shakespeare a "Fancy's child", warbling "his native wood-notes wild".

The real Ford, like the real Shakespeare, was an intellectual, a hard-nosed professional and -- yes -- a poet, too.

(α:) As for the tough-guy image, Gallagher is quite right in maintaining (β:) that *this* was strictly a mask to conceal a warm and generous nature, and an occasionally too soft Irish heart.

(LA Times, 16/iii/86, p. 6)

As for the tense forms of natural languages, it would seem that Prior would have held for *them*, as he did for the expressions that the sentential connectives symbolize (e.g. "if ..., then ..."), that "it would be unreasonable to expect any precise definition .... to cover everything which ordinary speech count as such" since "words have 'families' of meanings" and, thus, "any single formula will cover either too little or too much".
(J. Clifford, Tense and Tense Logic, pp. 18-20)

Similarly:

but then Leverhulme I would have I would have thought that this was right up *their* street (CEC)

In the following example, the Theme is picked up referentially in possessive Deictic in a nominal group:

As for the Alliance, *its* leaders insist that despite last week's disappointing harvest of seats, the coalition is here to stay.
(Time, 20/vi/83)

The relationship between the Theme and a subsequent constituent may also be one of lexical cohesion, as is the case with *drink* and *soma* in the following example:

As for drink, *soma* was daily imbibed by the Vedic warrior god Indra to help him overcome the terrible demon with whom he did battle, and we must assume that Aryan tribesmen also indulged in such libation.
(Wolpert, A New History of India)

and, more tenuously:

> As for English, I have only some unpublished *data*, sent me by the late Dr. Herdan, based on a count he carried out in certain English novels.
> (W. Hotopf, Semantic Similarity as a Factor in Whole-Word Slips of the Tongue)

In the examples given above, it would not be possible to conflate the Theme with the function it is cohesively related to, since that function is inaccessible; it is outside the domain of theme selection.

(ii) Structurally related themes

When Theme is structurally integrated with experiential structure, i.e., when it is conflated with an experiential function, thematic prominence may lead to problems quite similar to those illustrated for the assignment of New in Section II:3.2.6.2: An element is a constituent of one unit under one interpretation (usually transitivity or modification structure) and it is a constituent of another unit under a textual interpretation, more specifically as Theme.

For example, *this house* is the Minirange[8] of the prepositional phrase realizing the circumstance Locative (a transitivity function in the clause) and it is the Theme of the clause in which it appears initially:

This house we have lived *in* for ten years now

[8] Following Halliday (1985), we can analyze the structure of a prepositional phrase as Miniprocess (or Minorprocess: *in*) + Minirange (*this house*). The terms Miniprocess and Minirange have been chosen to bring out the similarity between the structure of the prepositional phrase and the nuclear transitivity structure of the clause involving Process + Range (as in *inhabit* [Process] *this house* [Range]).

We can describe this by saying that Theme and Minirange are conflated,[9] as diagrammed in the figure below (the @ sign indicates the non-thematic position of the Minirange):

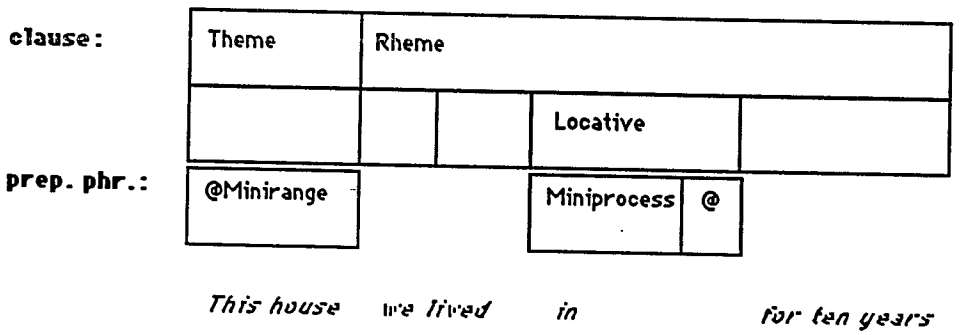


Fig. II:3.2.6-7: Theme and marked constituency

The problem is that since they are functions of different units, Theme and Minirange cannot be conflated by the current version of the conflation operator. That is, the domain of conflation is a single unit (see Section II:1.2.2.5). This restriction on conflation is almost always desirable. In fact, it reflects an important aspect of the functional organization of a grammar: The units of the grammar are units because they unite particular functional contributions, e.g. mood, transitivity and theme for the clause. However, there are some cases such as the Minirange of the prepositional phrase in the example above where the constraint is problematic.

~*~*~*~

[9] Compare and contrast examples of the type discussed earlier without structural integration by means of conflation: As for what happens next, Alfonsin, who ordered the historic trial, has offered no opinion *about* what happens next, at least in public. (LA Times)

As another aspect of the 'independence' of the thematic unit, it is worth noting the well-known phenomenon of the Theme of a clause serving to contextualize not only the clause it is part of but also subsequent clauses until it is cancelled or becomes irrelevant because of the development in the discourse. For instance, in the following example, the themes that bring out the points of contrast, *in mathematics* and *in natural languages,* both persist, rhetorically speaking, beyond the clauses they appear in; the first Theme thus provides the context for [1] and then also for [2] until it is 'cancelled' in [3]:

> [1] In mathematics, expressions of the form "If A then B" occur so often that it is necessary to understand the corresponding truth-functional operation. [2] It is obvious that, when A is T and B is F, "If A then B" must be F. [3] But in natural languages (like English) there is no established usage in the other cases (when A is F, or when both A and B are T). [4] In fact when the meanings of A and B are not related (such as in "If the price of milk is 25¢ per quart, then high tide is at 8:00 P.M. today"), the expression "If A then B" is not regarded as having any meaning at all. (Boolean Algebra)

This thematic expansion is probably particularly likely in clause complexes. The natural interpretation of the following example is that Paul Scott was honoured in two ways in 1963:

> In 1963 Paul Scott was elected a Fellow of the Royal of Literature and he was the winner of the "Yorkshire Post" Fiction Award for the third novel of the 'Raj Quartet', "The Towers of Silence".

The organization does not suggest that the first event has been nailed down temporally whereas the time of the second has simply been left unspecified. There is thus a good reason for thematizing the year of the second event to shift from the first context:

In 1963 Paul Scott was elected a Fellow of the Royal of Literature and in 1972 he was the winner of the "Yorkshire Post" Fiction Award for the third novel of the 'Raj Quartet', "The Towers of Silence". (Scott)

3.2.6.3.1.2 Transcendent theme selections and grammatical ambivalence

The constituency problem of the example is not created by the experiential metafunction. Rather, the conflict arises as the two metafunctions, the textual and the experiential, are mapped onto one another through Theme selection. Textually, *this house* is a constituent of the clause, but experientially, it is a constituent of the prepositional phrase. (This kind of structure is very common in wh-clauses, of course, where the wh-item is the unmarked Theme.)

While the ideational metafunction does not create the discontinuity problems discussed here, it still sets the parameters for the possibilities of thematization. For each type there is either a *'dual'* interpretation or a very similar parallel that relates to it as a second member of a dual analysis. We thus find the marked theme selections that assign thematic status to constituents 'outside' the clause structure only where there are ***grammatical ambivalences*** about structure in the first place[10]: these ambivalences will be discussed below. The ambivalence typically means that alongside the interpretation according to which the theme is selected outside the clause there is another interpretation according to which it is selected from within the clause. For instance, *look for* can be interpreted simultaneously as (i) Process: *look for* and as (ii)

[10] In this respect, the assignment of Theme differs from the assignment of New. Being part of the clause, Theme assignment is more restricted.

Predicator: *look* + Adjunct: *for.* The first warrants *This I have looked for all day;* the second *For this I have looked all day.*

The ambivalence is not ambiguity in the ordinary sense, of course. It is an extension of the metafunctional principle of simultaneous but different structural perspectives on the same syntagm.[11]

The dual interpretations of one and the same unit extend the principle of semantic types recurring in different units in the grammar, discussed in Section II:2.2. When a constituent of the clause constituting the domain of theme selection is realized by a complex, it is not possible to thematize only part of the complex, which follows automatically from the fact that it is the function realized by the complex rather than the elements of the complex that serves as a constituent in the clause in which theme selection operates. Thus it is not possible to thematize only the first element in the following nominal group complex as a wh-item:[12]

> *Who and unnamed investors* bought controlling interest in Wave Newspapers last March?

Only the Subject as a whole can be selected as the thematic wh-item. However, extension can also be expressed circumstantially in the clause as

[11] Such multiple perspectives are part of a multifunctional theory such as systemic theory; for instance, MOOD, TRANSITIVITY, and THEME constitute different functional structurings of the clause. The notion of ambivalence would not be possible to maintain if the theory demanded unique structural interpretations. Coming from a different tradition, Hockett (1984) argues against what he calls the uniqueness fallacy in much descriptive work: "even when two interpretations of the structure of an expression seem hopelessly at odds, the validity of one does not NECESSARILY entail the invalidity of the other. To assume the contrary without careful exegesis in each case is to fall into what I am calling the uniqueness fallacy."

[12] In this respect, the selection of a non-thematic wh-item in an 'echo' question is different: *You met Henry and **who** yesterday?*

Accompaniment (cf. Section II:2.2) and the Accompaniment and whatever is accompanied are independent constituents so both can be independently thematic and either can be selected as the Wh, as the following relative clause illustrates.

> Using that press, former UCLA Vice Chancellor Wilson, *who with unnamed investors* bought controlling interest in Wave Newspapers last March, intends to build the free-circulation, community oriented paper into a catalyst for economic development. (LA Times, 23/ix/85)

Similarly:

> He had glimpsed it again when *with Vera he* had visited The Great World (now black and deserted except for an AFP post) for it lay close by. (Farrell, p. 537)

3.2.6.3.1.3 Types of disrespectful theme selections

The cases where the problem arises fall into three types, all of which involve grammatical ambivalences. (All three involve experiential theme selection.) The first two are grouped as theme selections below clause rank:

(i) Theme selection from below clause rank, from prepositional phrase or nominal group:[13]

[13] There is no Theme selection from within the verbal group. Indeed, we would expect not to find any, since there are no ambivalences in the interpretation of the verbal group comparable to the ones involving the nominal group and the prepositional phrase discussed below. With the exception of thematic Finites in yes/no-interrogative clauses, verbal themes are very rare indeed and they are to be stated in terms of clause structure rather than verbal group structure. For instance, Residue may be thematic: we said we'd climb the mountain and (Theme/Residue:) climb the mountain (Mood:) we did. (One exception to the observation that verbal themes are rare is the type we find in certain types of news articles, viz. a thematic verbal process: Said Piers Jacobs, financial secretary of Hong Kong: "The measures would bring Hong Kong in line with those governments that are our principal trading partners." (Time) The projected status of what follows is

(i.i) Theme is conflated with the Minirange of a prepositional phrase serving as a circumstance or a circumstantial Attribute:

This bed has not been slept [in ___].

What are tarts made [of ___]? (Carroll)

(i.ii) Theme is conflated with the postmodifier of a nominal group following a head representing a 'facet':

Beijing has admitted that of some 2,500 monasteries with about 200,000 monks before the cultural revolution [only about *10* ___] were left after the havoc that it wrought not only in Tibet, but throughout China.(The Times of India)

Of Dorian Grey there is [only one *portrait* ___]

(ii) Theme is conflated with a constituent from a dependent clause projected by the clause the Theme is part of:

Yes. ||| α This I think || 'β Oscar feels ___ also or so I gathered from Alec on the phone. ||| (CEC, p. 59)

These cases of (ideational) theme selection are thus 'outside' the clause of which the Theme is a part, either (i) in terms of the rank scale or (ii) in terms of logical complexity:

made the point of departure: who says what is important in journalism, of course.)

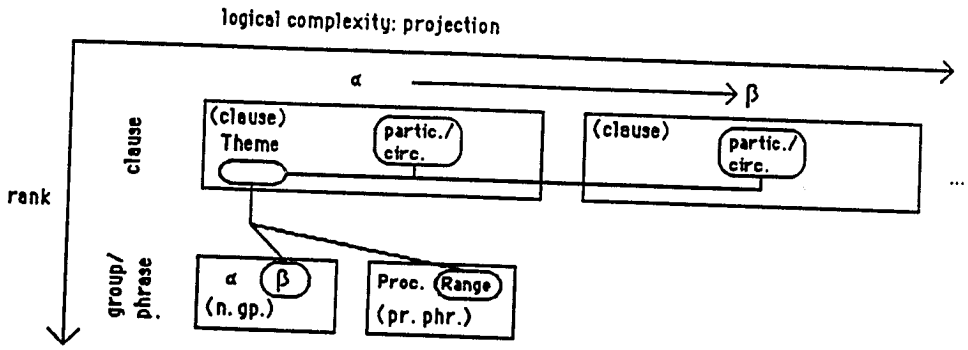


Fig. II:3.2.6-8: Theme selection 'outside' clause

(i) Rank: Theme selection from group / phrase

The two cases of theme selection from group/phrase, mentioned above, are:

(i.i) Thematic miniranges from prepositional phrases; and
(i.ii) Thematic postmodifiers from nominal groups.

(i.i) Theme selection from prep. phrases: thematic miniranges

Let's start with Theme selection from a prepositional phrase serving as a circumstance or circumstantial attribute. The problem with a thematic Minirange is that it is not a constituent of clause structure; together with the Minorprocess realized by a preposition it constitutes a prepositional phrase functioning as a circumstance in the clause. There are similar sequences of verbal group ^ preposition ^ nominal group where the preposition is part of a phrasal verb such

as *rely on, depend on, call for, look for, search for, put up,* and *take out* and the nominal group is a constituent of the clause rather than of a prepositional phrase; for example:

he	looked for	the keys	all night
Actor	Process: 'sought'	Goal	Extent
Theme			

Fig. II:3.2.6-9: Process ↘ verb + preposition

Here the nominal group functions as Goal in the clause and since Goal is a clause constituent it can be conflated with Theme without any problems:

the keys	he	looked for	all night
Goal	Actor	Process: 'sought'	Extent
Theme			

Fig. II:3.2.6-10: Process ↘ verb + preposition

Similarly, as Subject and unmarked Theme:

<u>They keys</u> were *looked for* all night

When <u>drinks</u> had been *called for,* and Mrs Lackersteen had usurped the place under the punkah, Flory took a chair on the outside of the group. (Orwell)

We thus have a case of ***grammatical ambivalence;*** there are *two structural interpretations* of the sequence of verbal group ^ preposition ^ nominal group, one grouping verbal group and preposition and one grouping preposition and nominal group:

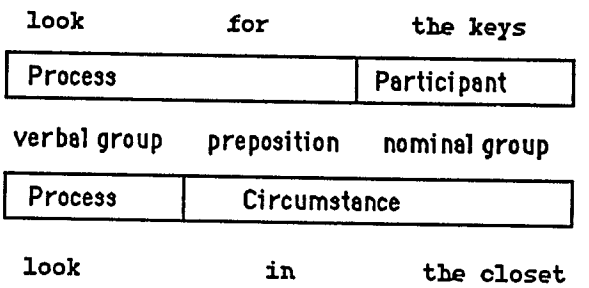


Fig. II:3.2.6-11: Different assignments of preposition

The version with the phrasal verb provides the other version with a model where the nominal group can be thematized as a constituent participant and it can be used as a model for an approach to solving the presentation problem; see approach (b) below. That is, the Minirange in the prepositional phrase can be thematized as if it were a participant in a clause with a phrasal verb. For an example such as *We lived in this house for ten years,* one on the model of phrasal verbs with *this house* as participant and one according to the analysis with *in this house* as a circumstance:

This house we *lived in* ____ for ten years

[In this house] we lived for ten years

Thematic miniranges: appproaches to solutions

I will note three approaches to solutions: (a) we can make alternative thematic candidates accessible by means of Expand, (b) we can make alternative thematic candidates accessible in a different layer of structuring, and (c) we can make alternative thematic candidates accessible by means of waiting conflations.

(a) Making alternative thematic candidates accessible by means of Expand. There is a simple descriptive approach to the problem, which is to simulate the rank boundary in the clause by anticipating the constituency of the prepositional phrase, thus making the phrase constituents clause constituents instead. The circumstantial functions can simply be expanded into a process function and a range function. For example, Locative can be expanded into Locator, realized by a preposition, and Location, realized by a nominal group. If this is done, not only Locative but also Location will be a clause function that can be conflated with Theme:

Theme/Locative: In this house we lived for ten years.
Theme/Location: This house we lived in for ten years.

The following diagram shows the conflation Theme / Location:

Theme					
Location ⊕			Locative		
			Locator	⊕	

This house *live* *lived* *in* *for ten years*

Fig. II:3.2.6-12: Constituency solution by means of Expand

The drawback is that this approach does not allow for prepositional phrase complexes, since the structure of a simple prepositional phrase (Locator + Location) is specified directly in the clause.

(b) Making alternative thematic candidates accessible in different structural layers. As an alternative to using Expand, we can posit two different constituent structures, one in terms of experiential functions and one in terms of interpersonal ones. In the experiential analysis, *in* is part of the Process[14] and *this house* functions as Range, on the model of clauses with phrasal verbs such as *look for the keys.* In the interpersonal analysis, *in this house* functions as Adjunct. Theme could then be conflated either with Adjunct or with Range; the version with the thematic Range is diagrammed below.

[14] More specifically, it might be taken as prepositional expansion of the the lexical verb:

Event ($\alpha \longrightarrow \beta$)

live in

Theme				
		Predicator	Adjunct: prep. phr.	
Range ⊕		Process: 'inhabited'		⊕

This house *live* *lived* *in* *for ten years*

Fig. II:3.2.6-13: Double constituency

This analysis has the potential advantage over the analysis using Expand that Adjunct can be realized by a complex prepositional phrase as well as by a simple one. However, the interaction with the experiential constituency would have to be worked out in more detail. Furthermore, we would need to be able to state that Adjunct is conflated with a complex of functions, Range and the part of the process realized by *in*, and the current version of the conflation operator does not allow for a conflation of a complex of functions, let alone a complex of one function (Range) and part of another (Process).

(c) Making alternative thematic candidates accessible through waiting conflations. Instead of trying to make the Minirange part of clause structure, we could allow Theme to conflate with a function outside of the structure of the clause it is part of under certain conditions by allowing 'waiting' conflations from one traversal of the grammar to another. This could be handled by specifying the function that Theme is to conflate with, i.e. Minirange, as well as the circumstantial clause function that the prepositional phrase of Minirange

realizes. I will denote this as

Theme / Minirange <Circumstance>

meaning: Theme is conflated with the function Minirange which is a constituent of the unit realizing Circumstance, where Circumstance stands for circumstantial clause functions such as Locative, Means, and Cause. In the clause, we can thus refer to a constituent once-removed by means of the bracket notation. In the prepositional phrase, we can simply state Theme < ^| > / Minirange to indicate that the Theme function is a constituent of the unit next above, i.e. the unit in which the prepositional phrase of the Minirange serves.

Now assume that, in the clause, the option of a thematic minirange is chosen. We can call this option 'circumstantial participant', since, from the point of view of theme selection, the minirange is treated as a participant in the clause. This choice is realized as Theme / Minirange <Circumstance> and Circumstance: thematic minirange. The function Minirange is not yet available, so the conflation Theme / Minirange has to wait and is simply posted for the function Circumstance together with the preselection of 'thematic minirange' and any other preselections. When Circumstance is realized, the preselection and waiting conflation can be fulfilled.

The approach is illustrated below for locative themes. If the marked theme of a clause is locative, there is a choice between a locative circumstance theme and a locative participant theme.

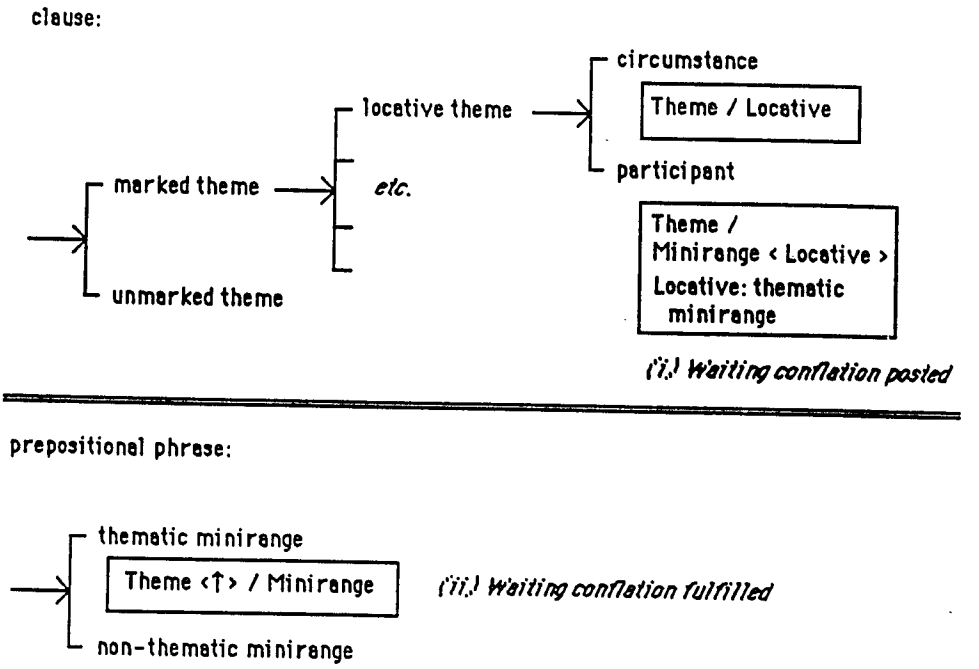


Fig. II:3.2.6-14: Locative theme selection

I will return to this possibility below.

(I.ii) Theme selection from nominal groups: thematic postmodifiers

Let's now turn to the second type of marked theme selected from a unit outside the set of clause constituents. Consider the following example

<u>Whisky</u> he would always accept another [glass of ___].

The Theme is selected from within the nominal group *another glass of whisky.* Two ideational interpretations apply to this type of nominal group, a logical one and an experiential one.

In the logical structure, *glass* is the head of the group and *whisky* is a postmodifier:

another (α :) glass (β:) of whisky

This logical structure is the same structure as in nominal groups in general; e.g.:

another (α :) glass (β:) on the shelf,
another (α :) glass (β:) from Orrefors
another (α :) glass (β:) with a handle

Experientially, the Head (α) is the Thing of the three nominal groups above. However, in the case of the first nominal group (*another glass of whisky*) another simultaneous, experiential interpretation applies, as shown in Halliday (1985:173-5). According to this interpretation, the postmodifier (β)*whisky* (rather than *glass*) is the Thing in the nominal group and *glass of* serves the function of what we might call **Facet**:

(Facet:) another glass of (Thing:) whisky

That is, the phenomenon being represented by the nominal group is the Thing (*whisky*) and there is a further, optional specification of what facet is selected (*another glass of*). This interpretation does not apply generally to nominal groups with postmodifiers.[15] The two interpretations are diagrammed below.

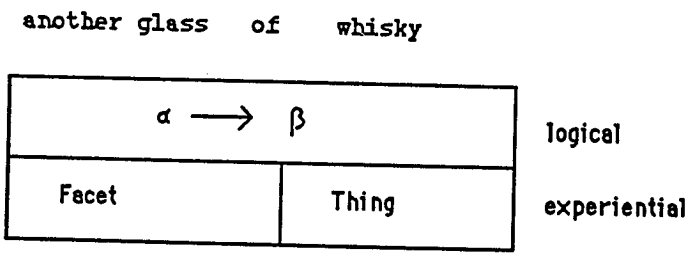


Fig. II:3.2.6-15: Logical and experiential structure involving facets

It does not apply to a nominal group with *glass of* (or another expression of measure etc., cf. below for various other types such as symbol) either, when *glass* is also the thing being represented, as in

I misjudged the distance to the table and broke my glass of whisky when I put it down

This normal interpretation (with the logical and experiential structures in phase with one another) is to be expected when the measure is treated as a specific discourse entity in its own right -- *these glasses of whisky, my two glasses of whisky,* and so on.

In the examples above, the facets are measures; but a measure is only one type of facet. More generally, a facet represent some facet, aspect, or selection of the Thing; it includes the following categories:

---

15 In addition to facets, I should also note certain postmodifiers in groups realizing attributes in ascriptive clauses, as in Edward Virginia is not [afraid *of* ___]. There is often another structure in which the postmodifier functions as a clause constituent; e.g.: be afraid of / have fear of ~ fear, be fond of / have a fondness for ~ like, be averse to / have an aversion for ~ dislike; be bigger than ~ exceed (in size), be similar to ~ resemble.Cf. also the discussion of grammatical metaphor in Section II:3.3.

measure:	cup, glass, bag, spoon, pack, slice, wedge
collection:	crowd, herd, school, flock, gaggle, pod
part:	top, front, side, back, face, slope
type:	type, kind, class, brand, model
instance:	instance, copy, example
symbol:	picture, painting, drawing, photo

Facets have a number of special grammatical properties. The Facet is like Deictic and Numerative in that it may presuppose the rest of the nominal group:

How much whisky would you like? -- (Facet:) A glass, please. / Just a little.

How many croissants? -- (Numerative:) Three, please.
Which croissants would you like? -- (Deictic:) Those, please.

Careful, I've painted the kitchen table. (Facet:) The top is still wet.

Some kinds of cattle are raised for the milk they give. (Facet:) *Other kinds* are beef cattle. (Farm Animals)

The dual character of examples such as *a glass of whisky* is evident in the possible transfer of epithets (cf. Halliday, 1985: 174): *a superb glass of whisky ~ a glass of superb whisky, a mug of hot chocolate ~ a hot mug of chocolate, a pack of hungry wolves ~ a hungry pack of wolves,* and so on. The epithet goes either with the Head of the logical structure of with the Thing of the experiential structure.

The measure facets are related to such indefinite number specifications as *a couple of, a number of,* and *lots of.* Here the number agreement tends to favour the Thing, but there may be uncertainty:

A couple of *friends were* discussing the crisis in the old tavern.

A fairly large <u>number</u> of *people are* / ? <u>is</u> still undecided.

There is variation in number within the nominal group with the type facets. Alongside examples such as *these types of theory* we find *these type of theories* and *these types of theories.* Type facets and measure facets can also be represented by counted masses alone. Thus *three beers* may mean 'three types of beer' or 'three bottles (glasses, etc.) of beer'.[16]

The part facets are related to prepositional complexes such as *on top of, in front of,* and *inside of.* A part reading of a nominal group is often implied without an explicit specification of the part face; cf. Langacker (1984).

What all the facets have in common is that they *represent* the thing in some way; they specify how the thing is to be interpreted -- quantitatively, partitively, symbolically, and so on. As already noted, this specification may be implied under certain circumstances, in which case the thing enters directly into the structure of the clause:

measure: I'd like three ['glasses of'] beers, please
type: We produce two ['types of'] wines in this region
part: We skied down ['the slope of'] the mountain.
symbol: She drew ['a picture of'] Henry for his mother

[16] Note also the lack of the indefinite article in groups such as *a type of theory* and *a type of elephant.*

Or, looking at the relationship from the other side, the facet may come to represent the thing, as already illustrated by the following example quoted above:

Some kinds of cattle are raised for the milk they give.
Other kinds are beef cattle. (Farm Animals)

This relation of representation between the facet and the thing and the ***ambivalent*** structural relationship they enter into help create the potential for thematizing only the non-facet part of the nominal group, i.e. the postmodifier in the logical structure where the facet is the head:

This is the novel ⟦ that I'd like [three copies of ___] ⟧

This dish I always ask for [two servings of ___]

Since the structure marker *of* belongs with the Facet in the experiential analysis and with the postmodifier in the logical analysis, it may sometimes be part of the Theme, sometimes not:

Which articles would you like [copies of ___] ?
Of which articles would you like [copies ____] ?

When the facet interpretation is less likely because the head of the nominal group is a specific thing in its own right, the potential for thematizing the postmodifer decreases:

Which articles would you like [Henry's copies of ___] ?

From Venice I bought [a glass ___]?

Of Anne I sent them [Henry's photos ___]

Similarly, when the relation between the head and the postmodifier is an appositive one rather than one of (potential) facet, the conditions for thematizing the postmodifier do not arise:

London I really like [the city of ___]

Of London I really like [the city ___]

There is a clause constituent that at first sight might look like a postmodifier specifying a set of which the facet is a subset. Alongside examples such as

Beijing has admitted that of some 2,500 monasteries with about 200,000 monks before the cultural revolution [only about *10* ___] were left after the havoc that it wrought not only in Tibet, but throughout China. (The Times of India)

where there is paraphrase with a postmodifer, *only about 10 of some 2,500 monasteries ... were left ...*, there are examples where the *of*-phrase does not function as a postmodifier; e.g.:

Of five minor candidates, only former Prime Minister Kim Jong Pil, 61, is taken seriously. (Time)

Of the many attempts to define "word" technically, I would particularly warn students against Hockett (1958, 19.2), 'A word is thus any segment of a sentence bounded by successive points at which pausing is possible.' (Strang, 1962: 67)

Of ten reviewers, only a few praised his play. ~ *Only a few of ten reviewers ... (Quirk et al., p. 893)

The Theme in these examples is more plausibly an Adjunct in the clause than a part of the (subject) nominal group, related to the internal specifications of subject matter discussed above (*as for, as to, regarding* + nominal group). The Theme specifies internal subject matter plus an indication that a subset or subtype will be picked up in the Rheme.

Thematic postmodifiers: approaches to solutions

Examples such as *Of ten reviewers, only a few praised his play* suggest the possibility of handling thematic postmodifiers descriptively by simulating the selection of the postmodifier on the same model. That is, in

> Of the Empire State Building I'd like a photo but of the Chrysler Building I'd like a drawing.

The themes, *of the Empire State Building* and *of the Chrysler Building,* would be generated in the clause as specifications of the subject matter. However, they still differ from internal subject matter in that an anaphoric reference to the Theme in the nominal group is unlikely: *Of the Empire State Building I'd like a photo of it* is odd, whereas *As for the Empire State Building I'd like a photo of it* is perfectly fine.

(ii) Theme selection from projected clauses

(ii:1) Characterization

The final type of theme selection from beyond the clause that is the point of origin of the Theme itself[17] that I will touch on is illustrated by the following example, already quoted above:

> Yes. ||| α <u>This</u> I think || 'β Oscar feels ___ also || or so I gathered from Alec on the phone. ||| (CEC, p. 59)

The thematic resources are part of the projecting clause, *I think* in the example, but the Theme is selected from outside this clause, from the projected clause, *Oscar feels [this] also.* The structure is diagrammed below.

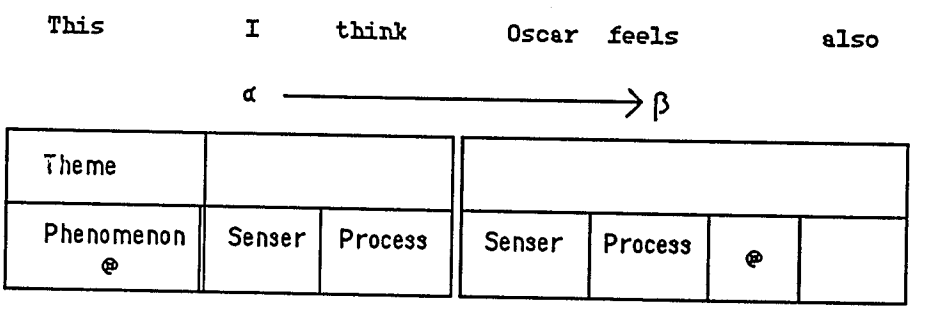


Fig. II:3.2.6-16: Theme selection from projected dependent clause

[17] A number of cases that have been analysed as bi-clausal and would thus be problematic are perfectly straightforward in a systemic-functional interpretation where hypotactic verbal group complexes are recognized (for this type of analysis, see Halliday, 1985: Ch. 7A). For instance, the following example is one clause with a complex verbal group realizing the Process of the clause: <u>Whom</u> were these two (α:) *seeking* (β:) *to please* __ ? (Wilder, p. 87) The thematic Wh is simply the Phenomenon of the clause and *seeking to please* is a complex verbal group. Similarly: <u>This</u> Matthew (α:) refused (β:) to believe __. (Farrell, p. 336)

The problem is thus that the thematic domain (the domain of theme selection) extends beyond the clause and in this respect the example is similar to cases where a single information unit spans more than one clause, as in (example from Halliday, 1967: 20)

// but I don't see || why they should lose **marks** for this //

However, the theme selection is restricted to cases of projecting clause complexes. Furthermore, the projecting clause has to be interpretable in terms of modality or evidentiality for the projected clause and this is where grammatical ***ambivalence*** comes into the picture. The projecting clause complex above involves what Halliday (1985: 332-41) calls an interpersonal metaphor of modality: the projecting clause expresses a modality of the projected clause. Alongside the interpretation of *This I think Oscar feels also* as a clause complex there is an alternative interpretation, according to which *I think* functions as a modal adjunct in the clause *This Oscar feels also* on the model of *This probably Oscar feels also:*

This	I 'probably' think	Oscar	feels	also
Theme				
Phenomenon		Senser	Process	
	Modality	Subject	Finite	

Fig. II:3.2.6-17: Projecting clause as modality

In the congruent version, where the modality is a modal Adjunct, there is just one clause and the domain of theme selection is thus the normal one.

We can see that there is a similarity between the situation with projecting clause complexes and postmodified 'facet' heads in nominal groups. In both cases, there is a grammatical ambivalence which involves the reinterpretation of the Head, either as modality or as facet; and both modality and facet specify something about the interpretation of the remainder, either interpersonally (modality) or experientially (facet); the 'epistemic status' of a proposition (probability, evidentiality) or of a thing (quantity, symbol, type, etc.) --

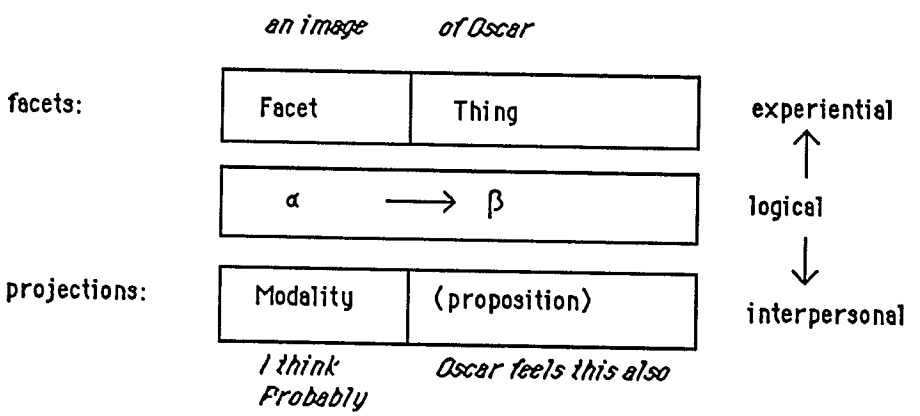


Fig. II:3.2.6-18: Facets and projections

The metaphorical status of a projection of the type illustrated above is indicated by the nature of the Moodtag. In the case of *This I think Oscar feels also,* it would be

This I think Oscar feels also, *doesn't he*

just as in the following examples

I suppose Peel is pretty well-known isn't he? (CEC, p. 171) 'probably'
I believe you can get it on the National Health, can't you (CEC, p. 180)
I think Hogarth drew some people with bow legs didn't he? (CEC, p. 598)

I suppose she's not your daughter, is she? (Shaw)
I believe we've discussed this woman before, haven't we? (Farrell, p. 466)

That is, the Moodtag picks up the Mood of the clause modalized by means of the projection rather than the projecting clause: we do not get *This I think Oscar feels also don't I* as we do in 'normal' projecting clause complexes such as *they thought that the earth was flat, didn't they?* Another indication of the status of the projected clause in relation to the projecting one is the typical absence of the binder *that*, elsewhere often used to indicate dependent status of the projected clause.

The Theme may be a structural one in a relative clause, conflated with the Wh.

and there were a certain number of characters ‖ (α:) <u>who</u> I think (β:) __ were waiting to sell some sheep or some cattle or something‖ 'who were probably' (CEC)

He has been accused of committing ethics violations ‖ (α:) <u>that</u> he says (β:) __ have long been common practice among lobbyists in the nation's capital‖. 'that according to him have long' (LAT)

The above Note does not say something ‖ 1 (α:) <u>that</u> I have heard (β:) Hockett say __ 2 and (α:) <u>which</u> I believe (β:) he has printed __ somewhere where I can't find it at the moment‖ (but see also the first sentence of 10.2 on page

107 here).(Joos, p. 280)[18]

But it's one of the small attempts being made here to turn back tomorrow, (α:) which most experts say (β:) - holds more rapid ecological decay, more frequent draughts and even more severe famines. 'which according to most experts' (LAT)

It may also be the Wh in a wh-interrogative clause:

(α:) Who did you say (β:) __ is going to receive phone calls for questions. 'who, according to you, is going to' (casual conversation)

The projecting clause may be mental, verbal, or impersonal relational:

verbal projection: Who did you say I should ask?

mental projection: Who do you think I should ask?

impersonal projection: Who does it seem I should ask?

When the projection continues beyond the first projected clause, the thematic domain may extend along projection chain:

She's the only person ⟦I know⟧ ⟦ (α:) who I don't think (β:) I've heard (γ:) __ say 'I wonder whether'⟧ (LAT)

(α:) Who did you say (β:) Henry says (γ:) Anne thinks (δ:) __ shot the ugly duckling?

[18] Alternatively, the first example (*that I have heard Hocket say*) can be analysed as a mental clause of perception with a rankshifted (embedded) clause as Phenomenon (*that ... Hocket say*). This is arguably preferable and we have to explain the accessibility of the elements of the phenomenal clause along lines that are related to those sketched above but not identical. The same remarks apply to the following example given below: She's the only person ⟦I know⟧ ⟦ (α:) who I don't think (β:) I've heard (γ:) __ say 'I wonder whether'⟧ (LAT)

Again, the situation is similar to what we find in the information unit (example from Halliday, 1967: 20):

// I think || you'll find || that it's just that it's **new** //

Clauses excluded from the domain of theme selection. The domain of theme selection is the clause of the theme and it only extends beyond this clause under explicitly stated conditions (cf. the discussion of constraints in Section II:1.2.2). Unless the projecting clause complex is also interpretable in terms of interpersonal metaphor with the projecting clause as a modality, the projected, dependent clause does not constitute an extended domain for theme selection.

Cases of **rankshift** (embedding) are thus automatically excluded, since the rankshifted clause is not related to another clause through projection in a clause complex; for example, (restrictive) relative clauses and *that*-clauses serving as postmodifiers in nominal groups are inaccessible to theme selection. Thus the following examples with a relative clause do not work

London I've met my old friend [[who lives in __]]

Where did you meet my old friend [[who lives __]] ?

Similarly, while we can get *London I thought Henry still lived in* with a projecting clause complex, examples of theme selection from rankshifted clauses such as the following are much worse:[19]

[19] Also compare the first example to London I regret Henry still lives in __ in the sense 'I regret to say ~ I say with regret', i.e. 'London Henry regretfully still lives in'.

London I regret the fact ⟦ that Henry still lives in __ ⟧
London I don't believe the claim ⟦ that Henry still lives in __ ⟧

Similarly, rankshifted clauses serving as Subject are inaccessible to theme selection:

London ⟦ that Henry still lives in __ ⟧ is extraordinary
London the claim ⟦ that Henry still lives in __ ⟧ is extraordinary
London ⟦ for Henry to live in __ ⟧ is hard

The interpersonal metaphor of modality can only arise if the process of the projecting clause can have modal significance. **Projecting clause complexes** where the process of the projecting clause is a **behavioural** one rather than a straight verbal or mental process are thus excluded:[20]

who did Henry grumble / groan / frown he had to meet __ ?

This is not the normal environment for a behavioural process in any case; it has been made to serve verbally.

Also excluded are clause complexes where the projected clause is **interrogative**, since these are harder to interpret as metaphors of modality. Thus while the following projection with an indirect declarative can be interpreted as a metaphor of modality and is perfectly fine --

[20] Although these are quite common with paratactic projection (quoting) in popular fiction, they are unlikely with hypotactic projection (reporting) in any case.

This problem *I think* ___ has come up before 'This problem has *probably* come up before'

-- a similar projection with an indirect interrogative clause cannot be interpreted as a metaphor of modality and is thus not acceptable:

This problem I wonder whether ___ has come up before

Similarly, we would not expect examples such as the following:

Who did you ask whether Henry had promoted ___ ?
This awful portrait I wonder why Henry has painted ___ .
Next Friday I seriously doubt whether Henry is coming ___ .

With the exception of the inability of the subject of the projected interrogative clause (as in the first example above), there may, however, not be a clearcut line.

In these cases, it is possible to use the same strategy as with thematic internal subject matter mentioned above (*as for,* etc.): specify the Theme without integrating it structurally with the ideational structure and pick it up by means of the cohesive relation of reference.[21]

[21] This may happen in relative clauses in informal speech; e.g.: You're getting commands in there (α:) that I don't know (β:) how they would be there (overheard), on the B-side of this album (α:) which I don't know (β:) if and when it will be available to the public ... (radio broadcast), and This was a mysterious phrase (α:) which I knew perfectly well (β:) what it meant (CEC, p. 249).

(ii:2) Projecting clause complexes: appproaches to solutions

(a) Projected clause represented as modality adjunct. We can approach the problem of selecting Theme from the projected clause by representing only one aspect of the interpersonal metaphor, viz. the interpretation according which the projecting clause is a modal adjunct in the projected clause. It would thus serve as an embedded clause realizing the modal adjunct Modality, as in

This [[I think]] Oscar feels also

Theme				
Phenomenon		Senser	Process	
	Modality: clause, mental, ...	Subject	Finite	

Fig. II:3.2.6-19: Projecting clause as modality

Under this interpretation, Phenomenon and Theme belong to the same clause, since *I think* has been embedded away, and there is consequently no problem in selecting Phenomenon as Theme. Similarly, a Moodtag would relate to the Mood of the modalized clause: *Oscar feels ... doesn't he?*

The approach just sketched may suffice for many purposes but there are two drawbacks. (i) It does not handle interdependency chains of projecting clauses, as in *This I think you said Oscar feels also, This I think you said you'd heard Oscar feels also,* and so on. (ii) It does not allow us to generate wh-interrogative clauses with Theme / Wh, since the Wh has to be ordered with respect to the Finite of the projecting clause and it is tucked away, inaccessible as an embedding. For example, Theme / Wh ^ Finite ^ Subject in the projecting clause *who do you think:*

α: Who do you think β: ___ will be the Democratic candidate?

(b) Leaving the domain of theme selection open

We can also explore the possibility of actually extending the domain of theme selection beyond the projecting clause. I will suggest below that we may want to re-interpret textual systems as dynamic or variable systems. The set of terms of a textual system would not be predetermined but would be variable according to the grammatical context. If textual systems are re-interpreted along these lines, the domain from which theme candidates can be selected can be extended without any conflict with predefined theme options. In the case under discussion, the domain of theme selection would be extensible along the line of hypotactic projection.

After this brief look at problems relating to theme selection, more specifically the selection of marked themes, I will turn to problems relating to information structuring.

3.2.6.3.2 Information prominence

I will start by illustrating how information prominence is related to constituent ordering (Section II:3.2.6.3.2.1); a particular ordering may be chosen over another alternative to accommodate information prominence. In certain cases, such an ordering may involve discontinuity and in Section II:3.2.6.3.2.2, I will illustrate how information considerations may lead to discontinuity; the section presents a survey of the various cases. Discontinuity is problematic and I will explore approaches to solutions to problems of discontinuity in Section II:3.2.6.3.2.3.

3.2.6.3.2.1 Information prominence and constituent ordering

The ordering of clause constituents may be influenced by considerations of information structuring: if a constituent is 'new' information but is not contrastive, contradictory, or the like, it is positioned so that it is unmarked news (Halliday, 1968: 213-4; 1970: 163-4; 1985). As we will see in Section IV:3.4, VOICE selection is a case in point: it is influenced by thematic considerations -- which participant is topical? -- as well as by information considerations -- which participant is 'news'? Other examples include (i) participants & circumstances, (ii) two participants, (iii) substitution, and (iv) extension as accompaniment.

(i) Participant & Circumstance. After the process, circumstances usually follow participants in the organization of the clause. However, a circumstance may precede a participant so that the participant has the status of unmarked new information.[22] In the following example, the sequence is Process (*began*

producing) fl Locative (*from under his arm*) fl Goal (*a great letter, nearly as large as himself*), making the Goal the point of information. Having been introduced, the new information is picked up in the marked theme of the following clause (*this*):

> The Fish-Footman began producing (Locative:) from under his arm (Goal:) **a great letter, nearly as large as himself,** and <u>this</u> he handed over to the other, saying, in a solemn tone, "For the Duchess. An invitation from the Queen to play croquet." (Carroll, p. 48)

Similarly:

> ... They picked fruit. They were ferrymen. And always they were silent. Their sombre faces took on (Adjunct:) from these labours (Complement:) **a male and gipsy cast.** Their hair was seldom cut, and under the dark mat their eyes looked up suddenly surprised and a little sullen. (Wilder, p. 49)

> She had let fall (Locative:) upon the boys (Extent:) for a moment (Medium:) **the detonation of her amazing eyes,** immediately dissipated in her amused recognition that they were twins.(Wilder, p. 50)

> It is worth bringing out (Adjunct:) in more detail (Complement:) just **what was involved in this extraordinary act of creative perception.** (Bohm & Peat, p. 36)

(ii) Two participants: Medium & Beneficiary. The textual principle at work in these examples is the same as in the case of the ordering of Medium and Beneficiary towards the end of the clause: whichever is to be given

[22] In speech, this can be achieved by organizing the clause into more than one information unit so that both the non-final participant and the final circumstance have prominence; for example: // lovers and rustics were most **persuasive**// over the **radio**// (CEC, p. 285); // and she really gave me a terrible **harangue**// over the **phone** // (CEC, p. 322)

informational prominence as news is made the culmination of the clause; see Halliday (1968: 213, 1970, 1985: 150) and Thompson (1987).

(iii) Substitution. The two cases mentioned above involve the relative ordering of constituents following the Process of the clause. In addition, a single constituent may also be delayed relative to its unmarked position by means of what Halliday calls substitution,[23] a strategy that allows the speaker to "assign to clause-final position an element which would otherwise appear as an unmarked theme" (Halliday, 1967: 23). For example:

> *it* does interest me *how memory works* (from Halliday, op cit.)
> I believe *it*'s a bit of an **amalgam** // this **map** (CEC, p. 441)
> *that*'s very **frightening that** (CEC, p. 472)

In the first instance, as unmarked theme, there is a pronominal reference.

(iv) Extension as accompaniment. Finally, instead of an extending nominal group complex, a circumstance of accompaniment may be used. While an extending nominal group complex would be one continuous constituent, the circumstantial accompaniment can occur late in the clause, as an independent constituent:

> Indeed within each professional group *a particular term* will be immediately understood **along with all its rich allusions.** (Bohm & Peat, p. 75)

The cases just mentioned do not cause any representational problems, since they involve the ordering of constituent of the clause. However, sometimes the

[23] It has been discussed in transformational grammar under the headings of right dislocation and extraposition.

appropriate information structuring cannot be achieved this way, but instead a clause constituent has to be split into two parts so that one part can be ordered late in the clause. The representational problem is how to refer to these parts when the ordering of the clause is specified.

3.2.6.3.2.2 Constituent orderings leading to discontinuity

The representational problem with information prominence is associated with discontinuity. A mood or transitivity constituent is split into two parts, one of which appears later than the other, to accommodate information structuring.[24] For instance, in the following example, the nominal group *things from which one averts the mind* is split into two, leaving the very general head of the group, *things,* as unmarked Theme and delaying the postmodifier giving the specific information of the group, *from which one averts the mind,* until it can be presented as unmarked news, i.e. until the end of the clause:

> their houses had burned down and (α :) *things* had happened to their children (β:) *from which one averts the mind.* (Wilder, p. 10)

The structure of the clause is diagrammed below.

[24] The assumption about written English is that the *placement*of New in the information unit of spoken English is reflected in the relative culminative *ordering* of elements of the clause in written English. For discussion, see Halliday's (1985) paper "It's a fixed word order language, is English" and Fries (1988).

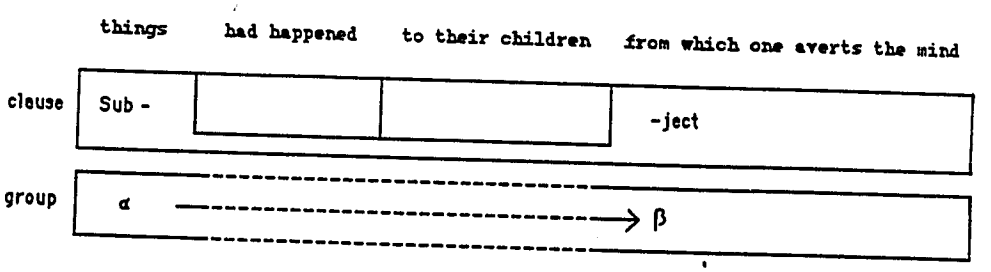


Fig. II:3.2.6-20: Split nominal group with delayed postmodifier

If the nominal group had not been split, the postmodifier *from which one averts the mind* would have been presented as thematic and the children would have been the unmarked news. They are not, but instances of calamities are, as the cotext of the example shows. Our example is one of a set of illustrations whose points are to give instances of calamities. Consequently, the calamities are newsworthy:

> It seemed to Brother Juniper that it was high time for theology to take its place among the exact sciences, and he had long intended putting it there. What he had lacked hitherto was a laboratory. Oh, there had never been any lack of specimens; any number of his charges had met **calamities;** their lungs had been **touched;** their houses had **burned down** and (α :) *things* had happened to their children (β :) ***from which one averts the mind.*** But these occasions of human woe had never been quite fit for **scientific examination.** They had lacked what our savants were later to call "**proper control**". The accident had been dependent upon **human error,** for example, or __ had contained **elements of probability.** But this collapse of the bridge of San Luis Rey was **a sheer Act of God.** It afforded **a perfect laboratory.** Here at last one could surprise his intentions in a pure state. (Wilder, pp. 9-10)

Our example ends the set of illustrations of calamities and there is a thematic shift. In the subsequent text span the category of calamity is given and thematic (*these occasions of human woe, they, the accident,* and so on). There is also a shift in newsworthiness: the point of this subsequent passage is the condition of study (*scientific examination, proper control, human error,* and so on).

Splitting the nominal group *things from which one averts the mind* into two parts is thus quite highly motivated from a textual point of view as a strategy for accommodating to information structuring.

Similarly:

> *A great deal of experimental evidence* began to accumulate after the Middle Ages ***which suggests that there is no fundamental difference between heavenly and earthly matter.*** But this knowledge tended to be kept in one compartment of the scientists' minds, fragmented from another compartment which continued to cling to the notion that heaven and earth are separate. (Bohm & Peat, p. 31)

In the case of split constituents, there is a significant connection with logical structure. The part that is sequentially "delayed" is a continuing link in logical interdependency structure, either a postmodifying β in simple group or a 2 in a paratactic complex. We have already seen this illustrated in the initial example, (α :) *things had happened to their children* (β :) *from which one averts the mind*. The following are most important cases of this type.

Clause:

(i) Process: β in a compound (phrasal) verb; e.g.:
They put the meeting off.

(ii) Participant (Subject or Complement): a postmodifying β (usually a clause) in a nominal group; e.g.:

Things had happened to their children from which one averts the mind.

(iii) Subject, Complement, or Adjunct: 2 in a complex; e.g:

So to Spain she went, to that land from which it takes six months to receive an answer to one's letter.

Nominal group:

(iv) Epithet: a submodifying β; e.g.:

This is a (α) hard act (β) to follow.

Let's survey these cases in some more detail, starting with a split Process realized by a phrasal verb.

(i) Process

The discontinuity in examples such as *They called the meeting off* arises for textual reasons, as Halliday (1968: 214; 1985) argues. In information structure, the function New is assigned to the process of the clause in an unmarked way, which means that it should be the last open-class lexical item of the clause. If there is a complement, this can be achieved by "splitting" a phrasal verb,

thereby creating discontinuity:

// I mean for instance one of the things that // has really shaken the world up// and may yet // have a very substantial // effect on things // which as far as I can see // although it was part of the landscape // nobody predicted // and certainly Kahn and his people didn't // is the sudden change in world commodity prices // especially oil // (CEC, p. 460)

// Alecko paused for a moment // surveyed this newcomer coldly // and having summed him up// yarped // loudly and scornfully // (from Halliday, 1970: 124)

The example *they called the meeting off* is diagrammed below.

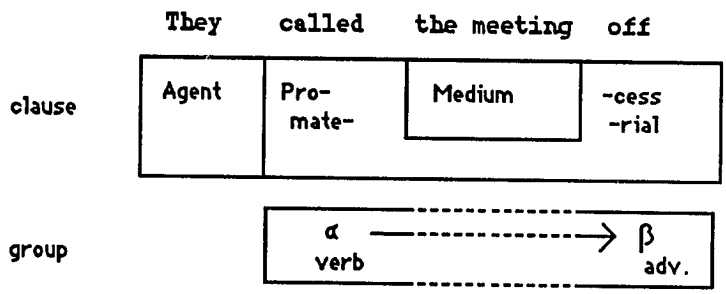


Fig. II:3.2.6-21: Discontinuity and delayed β

(ii) Participant

Subject. Similarly, a nominal group serving as Subject may be split, with a delayed postmodifier. The following nine examples constitute a fairly complete list from Wilder's *Bridge of San Luis Rey;* four of the examples nominal groups with verbal nouns as head and with a projected clause as postmodifier[25].

[25] Cf. examples such as the (α :) *thought* came to her (β:) *to send for Captain Alvarado* with *it* came to her
the discussion of substitution below.

Note that the process is often one of (dis)appearance & beginning:

their houses had burned down and (α :) *things* had happened to their children (β:) *from which one averts the mind.* (Wilder, p. 10)

Worse things were said of her, and (α :) *petitions* were afloat (β:) *that she be locked up.* (Wilder, p. 15)

In due time *the* (α :) *report* reached the Viceroy's ears (β:) *that one of his aristocrats had been openly baited in the theatre.* (Wilder, p. 24)

(α :) *Who* was there in Peru (β:) *to value the things she had valued?* (Wilder, p. 33)

Finally *a new* (α :) *fact* appeared (β:) *that was to have considerable effect on the lives of both the Marquesa and her companion: ...* (Wilder, p. 35)

At last *the* (α :) *time* came (β:) *to satisfy the supreme rite of Peruvian households looking forward to this event: ....* (Wilder, p. 37)

But during the penance she set herself for this impudence *the* (α :) *thought* came to her (β:) *to send for Captain Alvarado.* (Wilder, p. 67)

When the sun was shining the two could be seen walking along those artificial terraces in silence, Camila wondering when *the* (α :) *felicity* would begin (β:) *that she had always associated with social position* (Wilder, p. 98)

The (α :) *news* escaped from the sick-room (β:) *that Camila had become ludicrous in homeliness* (Wilder, p. 104)

Every day (α :) *decisions* are being made by local officials in our communities (β:) *that could drastically affect the quality of our lives.* (ZPG letter)

Just before the German plane took off, (α :) *word* was received (β:) *that the U.S. plane had been repaired and could fly soon.* (LAT, 16/xii/87)

The second example is diagrammed below, with a delayed postmodifier:

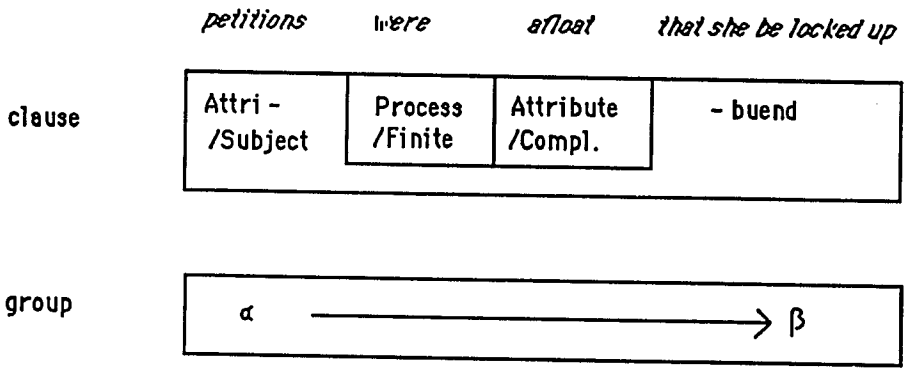


Fig. II:3.2.6-22: Split nominal group with delayed postmodifier

Complement. We also find split nominal groups serving as Complement:

What (α:) *relationship* is it (β:) *in which few words are exchanged, and those only about the details of food, ...* (Wilder, p. 48)

(α:) *What* was there in the world (β:) *more lovely than a woman doing justice to a Spanish masterpiece?* (Wilder, p. 91)

There was (α:) *something* in Lima (β:) *that was wrapped up in yards of violet satin from which protruded a great dropsical head and two fat pearly hands;* and that was its archbishop. (Wilder, p, 92)

Pepita remembered the theatre very well and sent (α:) *word* angrily (β:) *that the mistress refused to see her.* (Wilder, p. 26)

~*~*~*~

When he nominal group that is split is nonspecific, there may be a metaphorical interpretation in addition to the usual one:

(α:) *Anyone* is a fool (β:) *who tries to pat an alligator*

I'll give (α:) *anyone* ten dollars (β:) *who can help me find my cat*

I call a (α:) *person* bad (β:) *who lies and cheats and is unkind* (Maugham)

We can interpret these examples as before, with the Postmodifier (β) of the nominal group delayed:

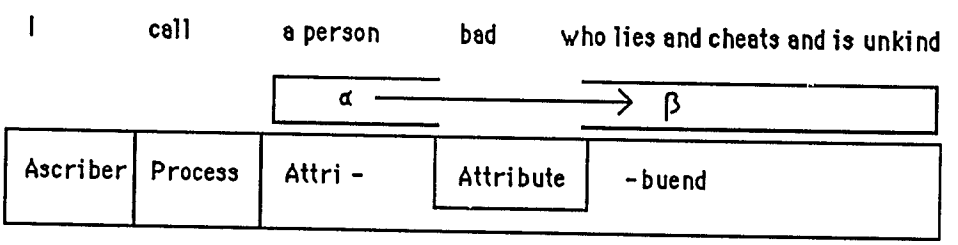


Fig. II:3.2.6-23: Discontinuous nominal group realizing Complement

But we can also explore these in terms of the clause complex. The example above would be interpreted as something like 'I call a person bad if they lie and cheat and are unkind'. See further below, Section II:3.2.6.3.2.3 (b).

Examples such as *word was received that* ... can be contrasted with an existential type where the 'word' is a rhematic Existent and there is thus no pressure for a split to accomodate both theme and news; for instance:

Today there came (α:) *word* (β:) *that the Governor had authorized destruction of British-owned engineering plant, oil and rubber stocks, liquor supplies and various other goods and materials that the Japanese might consider valuable.* (Farrell, p. 502)

Now on Monday, 8 February, came the (α:) *news* (β:) *that the Japanese had succeeded in landing on the island in the course of the night.* (Farrell, p. 502)

(iii) Complexes

We find group / phrase complexes with the continuing or dependent element of the complex delayed. These complexes include the following two types:

(i) paratactic & elaborating complexes: apposition; and

(ii) hypotactic & enhancing prepositional phrase (or adverbial group) complexes.

As we have already seen, there is another strategy available for extending complexes: what would be the delayed continuing element is represented as a circumstance of accompaniment, thus avoiding discontinuity.

(iii.i) Paratactic & elaborating complexes: apposition

Another discontinuous logical structure is apposition, in which case a continuing elaborating element is delayed. The initiating element may or may not be thematic:

(i) thematic

So (1:) *to Spain* she went, (2$^{=}$:) *to that land from which it takes six months to receive an answer to one's letter.* (Wilder, p. 14)

(ii) rhematic

I am going to engage you to write (1:) *a letter* for me, (2$^{=}$:) *a very secret letter.* (Wilder, p. 53)

There was (1) *this strange and noble figure* in Peru during these years, (2$^{=}$:) *the Captain Alvarado,* (3$^{=}$:) *the traveller.* (Wilder, p. 67)

(iii.ii) Hypotactic & enhancing complexes: narrowing

Hypotactic, enhancing complexes involve prepositional phrases (or adverbial groups). Consider the following clause.

I'll meet you *on Monday at nine.*

In the sequences *on Monday at nine,* which realizes the circumstance Locative, two prepositional phrases form an enhancing hypotactic prepositional phrase complex; the relation is one of narrowing (cf. Halliday, 1985: 220): (å:) *on Monday* (∫:) *at nine.* There are two locative thematic options, viz.[26]

(α:) <u>On Monday</u> (β:) <u>at nine</u> I'll meet you.

(α:) <u>*On Monday*</u> I'll meet you (β:) *at nine.*

[26] The third option is unlikely: (β:) *At nine* I'll meet you (α:) *on Monday.* That is, if only part of the prepositional phrase complex is thematic, it has to be the superordinate one: cf. Quirk et al. (1972: 486).

We might try to interpret the second alternative as an instance of a marked theme selection from within the prepositional phrase complex. However, it is the generalization about information prominence that is the applicable one here: the interdependent function in a logical interdependency chain is 'delayed'.

(iv) Nominal group: delayed submodification

In addition to the cases discussed so far, we find discontinuity local to the nominal group. It arises when a premodifier is submodified and this submodifier appears after the head of the nominal group; e.g.:

This is a (α:) harder problem (β:) than I had expected

Although they are nearly obligatory, discontinuities of this type may also be textually motivated: the phenomenon needs further study in discourse context.

After this brief survey, we can now turn to a consideration of approaches to solutions.

3.2.6.3.2.3 Approaches to solutions

Consider the first type of example again, *They called the meeting off,* with the process *call ... off.* It comes from Halliday (1985), where Halliday gives it the following transitivity structure in box diagram representation.

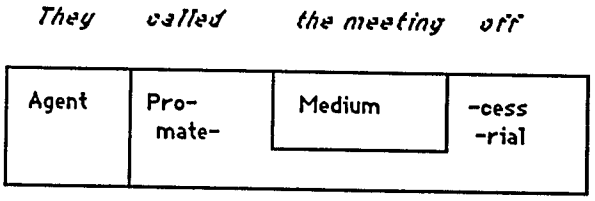


Fig. II:3.2.6-24: Transitivity structure of discontinuous example

Although the box diagram looks different from those used for examples without discontinuity, there is no problem in drawing it. In other words, the discontinuity can be represented in the box diagram. However, there is a problem for the formally interpreted realization operators described above. None of these operators can serve to specify the structure represented by the box diagram above.

For example, we cannot state Process ^ Medium ^ Process because that is contradictory, claiming that Process both precedes and follows Medium. Two approaches to this kind of problem have been used in the literature, (i) splitting a function into subscripted parts and (ii) inclusion.

(i) Split. Systemic grammarians have sometimes used a **subscript** to indicate two parts of a **split** function: $Process_1$ ^ Medium ^ $Process_2$ where the first part is realized by *called* and the second part is realized by *off*. However, this device does not make explicit what the two parts are; the identification of them is left to the knowledgeable grammarian.

(ii) Inclusion. Alternatively, we can introduce a new realization operator. For example, the notion of **inclusion** has been used: one function can be included within another function. Thus, we would have (Include Medium Process), usually Process <Medium>. The problem with this strategy is the same as with the splitting strategy mentioned above. If we only specify that one function (Medium) is to be included within another function (Process), this does not provide enough information to assign the first function a place within the second function. This problem does not invalidate the use of inclusion, of course, but it indicates that inclusion alone may not be enough, since more information is needed for an unambiguous specification of ordering.

In spite of the problem with the analysis of *called ... off* as a discontinuous realization of Process, we do not want to give it up. The sequential discontinuity is matched by continuity as well: 'call off' is one lexical item; it is not semantically decomposable.

I will now look at the problem of a discontinuous Process in some more detail and will then turn to discontinuous participants.

(i) Process in particular

Halliday (1985) provides a solution to the problem of representing examples with discontinuously realized phrasal verbs. It relies on the metafunctional layering, so it could not be stated only in terms of one dimension of structuring.

Halliday's account involves both transitivity structure and mood structure. The two interpretations for *They called the meeting off* are:

(i) Transitivity: one Process (of class 'material') *call off.* The lexical specification can be stated in terms of Process: Process: 'material'. (In other words, Process is preselected for the lexical feature 'material'.)

(ii) Mood: one Predicator *call* and one Adjunct *off.* The sequence can be stated in terms of Predicator and Adjunct: Predicator ^ Complement ^ Adjunct.

Each interpretation alone only captures part of the facts, but when they are brought together, we get the full picture. The mood structure is also used to state the inflectional form of the verb. The function Finite is constrained to be 'past' and since the clause is declarative and simple past, Finite is conflated with Predicator. The box diagram for the example is as follows (see Halliday, 1985):

	They	called	the meeting	off
TRANSITIVITY:	Agent	Pro- mate-	Medium	-cess -rial
MOOD:	Subject	Finite / past Predicator	Complement	Adjunct

Fig. II:3.2.6-25: Two layers of structuring for discontinuous example

Halliday's analysis represented in the box diagram avoids the earlier problems discussed above: Since there is no discontinuity in the sequence

Predicator ^ Complement ^ Adjunct, there is no need to design a new inclusion operator and there is no need to split the Process. (The problems with these two solutions were discussed above.) Since we retain an unsplit Process function, there is no problem in constraining it to be one lexical item. Finally, since Predicator and Adjunct are kept distinct, there is no problem in conflating Finite and Predicator, constraining that part of the phrasal verb to be 'past' in our example, i.e. *called off* rather than *call offed.*

There is a problem, however, when we move from the box diagram representation to look for a more formally interpretable realization statement. The problem is the Conflate operator itself. If we conflate Process and Predicator and then also Process and Adjunct to get the column alignment in the box diagram, the result is just one constituent, Process/Predicator/Adjunct. Instead of this conflation, what we need to do is to conflate Predicator and Adjunct with Process without conflating Predicator and Adjunct with one another. We need to be able to state (Predicator & Adjunct) / Process, i.e., more generally:

$$(\text{Function}_1 \ \& \ \text{Function}_2) \ / \ \text{Function}_3$$

Although this kind of conflation does not exist as a Nigel realization operator now, something like it is supported in Functional Unification Grammar: the solution is presented in FUG terms in Kasper (1987: Section 5.1).

(ii) Participants as Subject or Complement in particular

We can now turn to discontinuous participants. Possible analyses include (a) substitution, (b) clause complex metaphor, and (c) split.

(a) Substitution

According to the split analysis, there is discontinuity in the examples cited, since the two parts are analysed as being parts of one constituent. However, we can explore the possibility that the relationship is not one of constituency, thus denying and removing the discontinuity. The alternative to a constituency relationship comes from the textual metafunction. An example such as

> But during the penance she set herself for this impudence *the* (α :) *thought* came to her (β:) *to send for Captain Alvarado*.(Wilder)

could be analysed in terms of cataphoric reference instead of structure as far as the nominal group is concerned: 'this thought came to her: viz. to send for Captain Alvarado'. That is, it could be analysed on the model of THEME SUBSTITUTION in the textual component of the clause, which would serve to bring out the textual motivation; for instance:[27]

> I believe <u>it</u>'s a bit of an amalgam, <u>this map</u>. (CEC, p. 441)

[27] Here *I believe* serves as the interpersonal part of the Theme -- it's a metaphorical modality (cf. Section II:3.2.6.3.1.3 above and Section II:3.3) -- and *it* serves as the experiential (topical) part of the Theme.

Halliday (1967: 239) characterizes substitution as follows.

> Substitution is also associated with the theme, being an option whereby the speaker can assign to clause-final position an element which would otherwise appear as unmarked theme, as in *they don't seem to match, these colours*. ... The substitute form almost always occurs with tone 13, with the minor tonic on the 'delayed' element; other tones are possible, but it is not possible for such a clause to occur as tone 1 with the delayed element carrying the only information focus. The information structure shows the significance of this pattern. The substituted element is as it were a delayed theme; like the clause-final adjunct it is a secondary information point.

An example such as *they don't seem to match, these colours* can serve as a 'model' for elaborating group/ phrase complex examples such as

> There was (1) *this strange and noble figure* in Peru during these years, (2=:) *the Captain Alvarado,* (3=:) *the traveller.*

where *this* is used to achieve cataphoric reference. Other examples of substitution cited by Halliday include

> It worries me to see him so overworked

and it is this type according to which examples such as*the thought came to her to send for Captain Alvarado* might be analysed.

(b) Clause complex metaphor

In the substitution type of analysis the two parts that are regarded as one discontinuous constituent in (a) are no longer treated as being related by constituency, but they are still part of the same clause. We might take one step further and regard them as being related as clauses in a clause complex. (This is, of course, only a possible strategy when the second, delayed element is a clause.) We could do this by means of the notion of grammatical metaphor (Halliday, 1985; to be discussed below in Section II: 3.3): what looks like a discontinuous constituent can also be interpreted in terms of a clause complex.

There would seem to be two types, projecting clause complexes and enhancing ones.

Projecting clause complex. We can regard the projecting noun at the head of a 'split' nominal group as a metaphorical representation of the process of a projecting clause and the postmodifier as the projected clause. For example:

petitions were afloat that ...	people petitioned || that ...
the report reached the ... Viceroy's ear that ...	they reported to the Viceroy || that
the thought came to her that	she thought || that ...

The first example is analysed below along these lines.

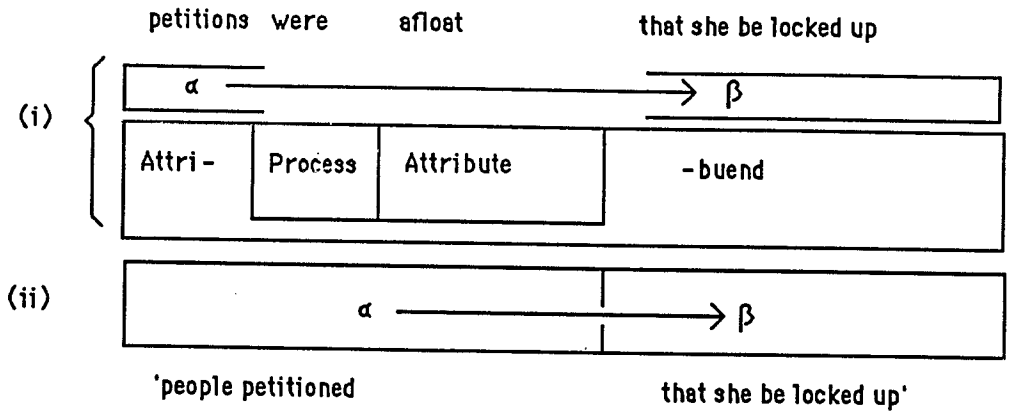


Fig. II:3.2.6-26: Discontinuous ex. (i) as metaphor for clause complex (ii)

Examples involving an impersonal 'fact' noun serving as Head are less clearly metaphorical representations of a clause complex -- *the news escaped from the sick-room, a new fact appeared* -- but they have the same character of a reified verbalization that can float, reach somebody, come to somebody, escape, appear, and so on.

Enhancing clause complex. The example *I call a person bad who lies and cheats and is unkind* was analysed above as having a split nominal group serving as Attribuend. Alternatively, we can interpret examples such as these as metaphorical, adding a clause complex analysis in which the defining relative clause serving as Postmodifier is an enhancing clause in a hypotactic complex:

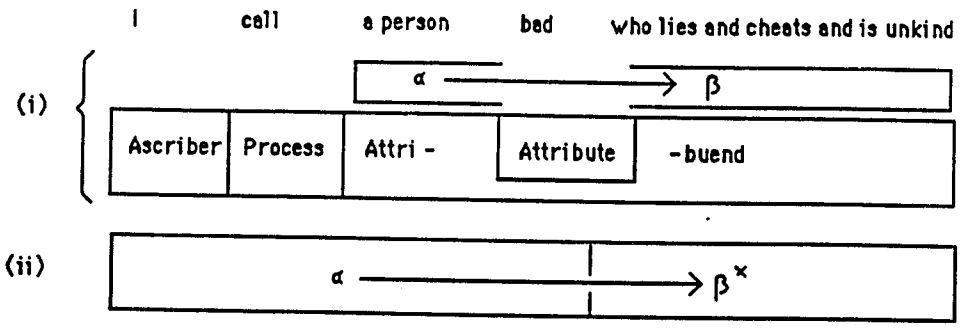


Fig. II:3.2.6-27: Discontinuous ex. (i) as metophor for clause complex (ii)

According to the second interpretation, the example is a metaphorical version of something like 'α : I call a person bad, β: if they lie and cheat and are unkind'.

(c) Split

Even if we can reanalyze certain examples of discontinuity and simulate the treatment of certain others, we still have the task sketching an addition to the grammar that can handle discontinuity.

It is under the *split* analysis applied to the examples cited above that they have the appearance of discontinuity. A constituent is split into one part that contains the α (Head) or Initiating link in a logical interdependency structure and a delayed part, the β (Postmodifier) or Continuing link in the logical interdependency structure. The logical interdependency structure is either

hypotactic, as the modification structure of a nominal group, or paratactic, as in appositive (elaborating) group complexes:

(i) hypotactic: modification structure: postmodification

In the movement from Aristotle to Newton, and from Newton to Einstein, *new sets of ideas and concepts* have appeared *which seemed to be irrelevant or incommensurable with older ideas.* (Bohm & Peat)

(ii) paratactic: group / phrase complex: elaboration

There was (1) *this strange and noble figure* in Peru during these years, (2=:) *the Captain Alvarado,* (3=:) *the traveller.*

It is thus possible to rely on the nature of logical structure in dealing with the discontinuities. The simplest strategy may be the following.

(i) In the clause, we make a potential 'culminative landing site' available to which postmodifiers may be delayed, but we do not set up systems to anticipate the delay.

(ii) At group rank, we set up systems that allow for the option of delaying interdependent elements -- postmodifiers and continuing elements. The ordering inherited from the position in the clause only applies obligatorily to the head or initiating element of the logical structure. Delay means delay until the landing site has been prespecified in the clause.

Alternatively, we can locate the information-based culminative choice in the clause and let it have the same kind of variable domain as the selection of New in the information unit must have. The delay arises from the resolution of the conflict between this demand for ordering and the position the clause constituent has as participant, circumstance, or process.

The second type of approach presupposes a special kind of textual system that is dynamically variable. I will consider this kind of system very briefly.

3.2.6.4 Textual systems: variable/dynamic systems

Textual structure can be characterized as a pulse or a wave. Is there a systemic correlate, a system pulse comparable to the structure pulse? Arguably there is, if the pulse is interpreted as dynamic/variable in nature: A possible correlate is a dynamic/variable system.

As an example, take theme selection. The issue here is how to represent the resources of thematization. What are the thematization options? For example, what are the experiential theme options from the transitivity of a clause? In a declarative clause, the unmarked theme is the Subject:

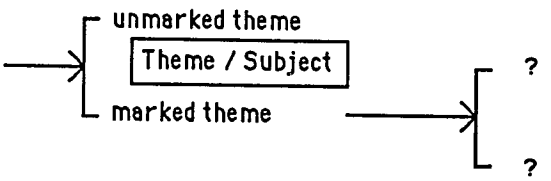


Fig. II:3.2.6-28: The problem of specifying marked thematic candidates

The question is what the marked theme is. The answer depends on transitivity choices; e.g. is the clause middle or effective, benefactive or non-benefactive, ranged or non-ranged; on related circumstantial choices; e.g. is there a Locative, a Cause, a Manner, etc.; and also on voice choices. There are various ways of working towards an approach to the situation.

(i) A dynamically variable system

We might explore the possibility of designing a system with a variable set of terms. The theme potential varies with the transitivity choices. It can be characterized, at least informally, as a system whose potential is dynamic/variable. For example, in a middle (non-ranged) clause, there is only one participant Theme candidate, the Medium; in an effective (agentive) clause, there are two, the Medium and the Agent; and in a benefactive clause, there are three, the Medium, the Agent, and the Beneficiary. Similarly, there are as many circumstantial Theme candidates in a clause as there are circumstances. The variable system is diagrammed below.

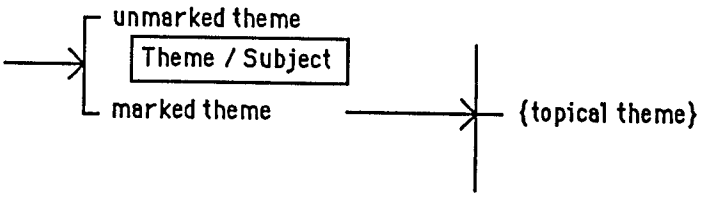


Fig. II:3.2.6-29: Variable system

The question is how the values of the system variable are determined. There is an alternative approach where this question does not arise.

(ii) Selection conditions

We can write a system for the maximal set of thematic candidates. To avoid the selection of a thematic candidate that is not supported experientially, we can then impose selection conditions on the terms (cf. Section II:3.1.3). For instance, 'complement theme' can only be selected if the transitivity choices are such that the clause has a complement and 'locative theme' can only be chosen if the feature 'location' is selected in the circumstantial system LOCATION. This approach is exemplified diagrammatically below.

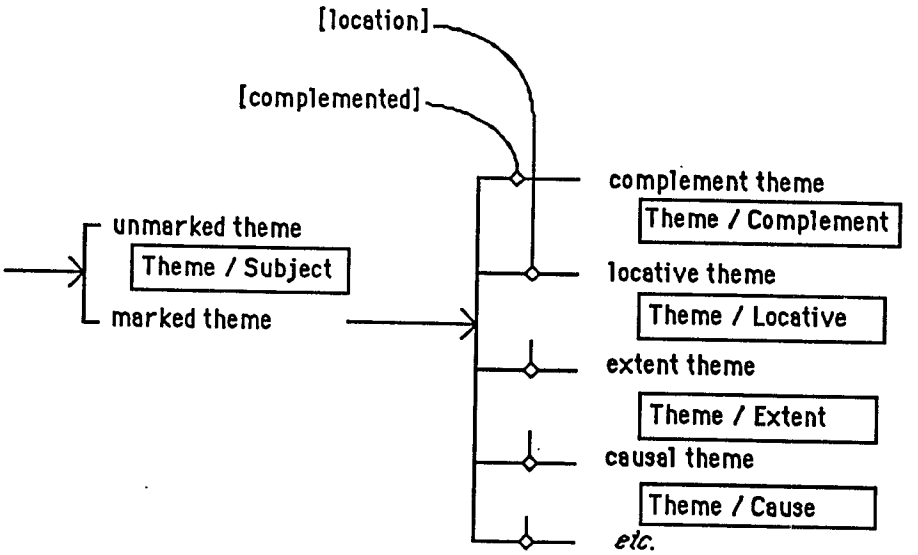


Fig. II:3.2.6-30: Selection conditions

(To allow multiple selections from the system, we would have to make the system an 'and/or' system rather than the usual 'exclusive or' system.) The approach sketched above should work as long as the system variable can be pre-defined. That is much harder, of course, when we also allow for theme selections from outside the domain of the clause.

(iii) Function variable

As an alternative to putting the variability into the system itself, we can represent it in terms of a function variable X that can range over participants and circumstances; informally:

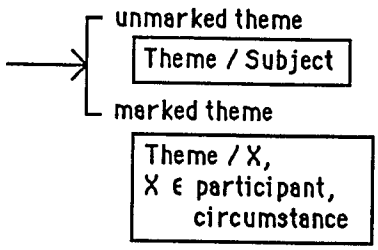


Fig. II:3.2.6-31: Variability in terms of function variable

The question again is how to define the value of the function variable. One possibility might be to do this through 'co-reference': X is the participant or circumstance that is co-referential with Theme.[28] (In terms of the chooser and inquiry framework discussed in Chapter III, this would mean that X is the participant or circumstance that has the same hub-assignment as Theme.) If there is no co-referential participant or circumstance, the assignment of a value to X is postponed until outside the domain of the clause, if the right conditions obtain.

(iv) Semantic control

I noted in Section II:3.1.3.3 (ii) that one approach to the question of how to represent marking conventions in the system network is by exercizing semantic control over the two systems whose features are related by the marking convention. We might use a similar semantic strategy to coordinate thematic

[28] It would be necessary to work out the details in such a way that multiple references could be handled. For instance, in an example such as *I work for Henry with him* it would be necessary to be able to choose between thematizing Henry as Behalf or as Accompaniment. Note that reference in the language described is itself a textual resource (cf. the earlier discussion of *as for* themes picked up referentially).

selections and transitivity selections. The situation is not identical to the one discussed in Section II:3.1.3.3 (ii). In the earlier case, one semantic feature led to two grammatical selections. The present case is somewhat more complex. There are two independent set of factors leading to the grammatical selections, an experiential set controlling transitivity and a textual set controlling theme. Now, if we assume that these sets of factors are encoded in two separate choosers (cf. Section II:1.2.1.5.2), the trick is to get the choosers to 'communicate' with one another so that they can coordinate the grammatical selections they are responsible for, but that would requite an extension to the current chooser & inquiry framework (cf. Section III:4.4).

The notion of a dynamic or variable system is perhaps the most attractive approach, but it is just a way of thinking about a problem like theme selection; it is not a solution. It raises the issue of dynamic accounts discussed earlier. It does not seem unreasonable that some systems are inherently dynamic rather than static, particularly systems deriving from the textual metafunction, i.e. the enabling metafunction concerned with the process of meaning itself.

3.2.6.5 Conclusion

I have discussed representational problems that can be interpreted in terms of the textual metafunction. Here I have focussed on THEME and CULMINATION / INFORMATION. Thematic problems arise when the Theme of a clause is selected from outside the clause itself; as shown above, this only happens if the status of the thematic element is grammatically ambivalent. To accommodate information structuring, the ordering of constituent elements may be

manipulated and in certain cases this leads to discontinuity; as shown above, this only happens if the discontinuous parts of a constituents are related by logical interdependency structure. After looking at textual issues from a structural point of view, I turned to a brief discussion of textual systems.

In addition to the textual issues discussed here, there are other textual problems; in particular:

THEME PREDICATION, e.g.:

It was **in these days** that members of the Mayfair AFS unit first began to be seen at fires here and there in the city with their glistening new trailer-pump. (Farrell, p. 334)

THEME IDENTIFICATION, e.g.:

[[What is involved]] *is* a kind of metaphor in which electricity and magnetism are equated. (Bohm & Peat, p. 74)

SUBSTITUTION & ELLIPSIS, e.g.:

He tried to arrange an appointment with the Governor's staff: he had never had any trouble *doing so* before, ... (Farrell, p. 502)

LEXICAL COHESION, e.g.:

Einstein's *insight* widened the possible range of communication within physics so that today electromagnetic phenomena are *perceived* in a very different light from what had earlier been the case. Of course Einstein's *perception* went beyond this particular case, for he was led to postulate that time

is not an abosulte. (Bohm & Peat, p. 74)

I will touch on lexical cohesion in Section II:4.7.3. THEME PREDICATION, THEME IDENTIFICATION, and SUBSTITUTION & ELLIPSIS raise issues similar to those discussed in the context of THEME and INFORMATION. For instance, there is the same need to explore a variable type of system. SUBSTITUTION & ELLIPSIS point to the second-order nature of the textual metafunction discussed above. In particular, both operate in terms of the grammatical structure that comes into existence because of the other metafunctions.

In addition, the strategies of THEME PREDICATION and THEME IDENTIFICATION involve the re-representation of a clause in terms of identifying relational transitivity organization, which can be seen as related to grammatical metaphor, where e.g. one transitivity structure is re-represented by another transitivity structure. I will now turn to problems of grammatical metaphor.

3.3 Grammatical metaphor

There is a cluster of representational problems that can be understood through Halliday's notion of **grammatical metaphor**. To address "metaphorical problems", I will summarize this notion and then suggest a particular typology of grammatical metaphor. The reason for the descriptive interlude is consistent with the general thrust of my exploration of representational issues: the goal is to find functionally motivated solutions to the problems identified, not just to increase the generative power of the grammar; there is no point in having solutions to problems in representing grammatical metaphors if we do not know how to use them in generation.

3.3.1 The notion of grammatical metaphor

The idea of grammatical metaphor is an extension of the traditional notion of lexical metaphor. One type of grammatical structure is represented as if it were another type. Halliday's (1985: xix) characterization was quoted above in Section I:1.2; part of it can be repeated here in the ontogenetic context he puts it in:

> The adult language has built up semantic structures which enable us to 'think about' our experience -- that is, to interpret it constructively -- because they are plausible; they make sense and we can act on them. And the systems of meanings have in their turn engendered lexicogrammatical structures that are likewise plausible: hence we have verbs and nouns, to match the analysis of experience into processes and participants (...). This is how children are able to construe a grammar: because they can make a link between the categories of the grammar and the reality that is around them and inside their heads. They can see the

sense that lies behind the code.

Later on, they will learn the principle of 'grammatical metaphor' (...), whereby meanings may be cross-coded, phenomena represented by categories other than those that evolved to represent them (e.g. *automatic car wash*). This is a later and much more complex step in the evolution (ontogeny, and presumably also phylogeny) of the system. Grammatical metaphor is a dominant feature of adult language, and it is learnt rather late. ...

At this point we shall incorporate into the grammar the notion of congruence. ... A congruent expression is one in which this direct line of form to meaning to experience is maintained intact, as in young children's language like *man clean car*. A metaphorical expression is one in which the line is indirect.

For example, *we left the party at eight* is a congruent clause and *we left the party before Henry arrived* is a congruent clause complex. In contrast, *we left the party before Henry's arrival* is a clause complex represented as if it were a clause. We can indicate its metaphorical status by analysing it both as a clause complex and as a clause, thus contrasting it with the other two examples, which are 'either or' instead of 'both and':

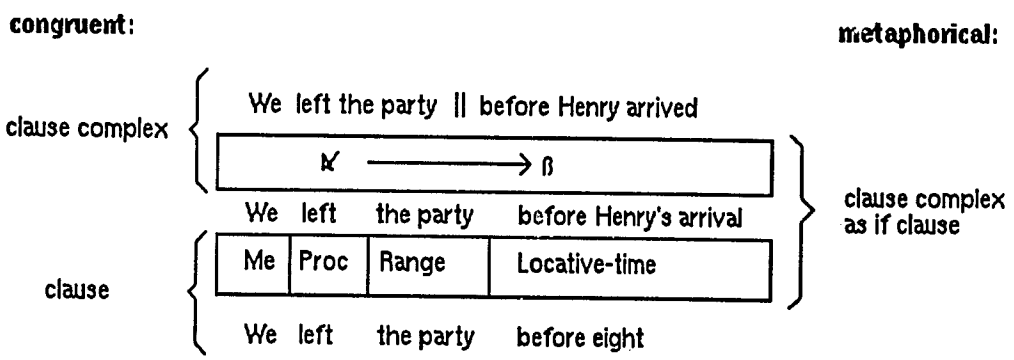


Fig. II:3.3-1: Metaphorical representation

We can see, then, that the metaphor involves ***two simultaneous*** representations. According to one view, it is a clause complex and according to the other it is a clause. The metaphor embodies both; it is a representation of a clause complex as a clause. In this respect, metaphor is similar to both stratal organization and metafunctional organization -- all three involve the relation of symbolization. We might explore either similarity in developing an approach to grammatical metaphor.

(i) We can treat the congruent and metaphorical versions as stratally distinct: the congruent version is the semantic representation and the metaphorical one is the grammatical representation.

(ii) We can treat the congruent and metaphorical versions in the same way as we treat different metafunctions *within* the grammar: that is, the congruent and metaphorical versions are not stratally differentiated, but they are simultaneous representations within the grammar.

The second approach may well give more insight into the problem of grammatical metaphor but it is also more difficult to handle, since it requires the reconciliation of the congruent and metaphorical structures within the grammar. In general, I will assume the first kind of approach, but with the important qualification that the semantic-congruent representation may be elaborated to reflect the meaning differences introduced by the metaphorical mode of expression. It is important to recognize that grammatical metaphor *creates new meanings;* it is not simply a matter of representing the same meanings metaphorically. The meaning-creating power of grammatical metaphor is discussed in Halliday & Matthiessen (in prep.) and I will not focus on it here.

3.3.2 Grammatical metaphor and text generation

Grammatical metaphor introduces new problems at various levels for the task of text generation. I will consider grammatical issues here, but there are also problems in the area of 'knowledge representation' (cf. Chapter IV).

3.3.2.1 Grammatical metaphor in registers for generation

Since problems are associated with grammatical metaphor, it would seem reasonable to postpone registers that are heavily metaphorical if they can be characterized in principled ways. There is good reason to think that they can, although we need further extensive text studies. For instance, if we look to field, it seems clear that e.g. history, economy, and physics are constructed metaphorically (from an ideational point of view, cf. below), though in different ways. Further, if we look to mode, writing and speech are differentiated: writing favours the metaphorical mode of representation (again, ideational).

However, some of the registers that are desirable to address by means of text generation are in fact heavily metaphorical. For instance, consider the following example of an economic report.

> Steep <u>declines</u> in capital spending commitments and building permits, along with a <u>drop</u> in the money stock pushed the leading composite down for the fifth time in the past 11 months to a level 0.5% below its high in [month] [year]. Such a <u>decline</u> is highly unusual at this stage in an <u>expansion</u>; for example, in the three most recent <u>expansions</u>, the leaders were rising, on average, at about a 7% clip at comparable phases in the cycle. While not signaling an outright <u>recession</u>, the current protracted sluggishness of the leading indicators

appears consistent with our prognosis of sluggish real GNP growth over the new few quarters. (FRB)

This text illustrates the highly metaphorical character of economic reports. I have picked out only one of several types of metaphor: changes that have been reified by means of nominalization. For instance, *the money stock dropped* is represented metaphorically as *a drop in the money stock.* (I have focussed on the grammatical metaphor of nominalization. Both versions rely on a lexical metaphor as well: increase and decrease are represented as if they were vertical movements in space.) Thus, instead of writing

α 1 Capital spending commitments and building permits declined steeply α 2 and the money stock dropped, β pushing the leading composite down for the fifth time ...

using a complex of three clauses, the writers give us the single clause quoted above:

Steep <u>declines</u> in capital spending commitments and building permits, along with a <u>drop</u> in the money stock pushed the leading composite down for the fifth time

Even the three-clause version is still metaphorical and can be further 'unpacked':

α 11 People committed less and less to spending capital α 12α and asked less and less α 12βα to be permitted α 12ββ to build α 2 and the money stock dropped, β pushing the leading composite down for the fifth time ...

The first part of the clause complex can be contrasted with the nominal group in the original version:

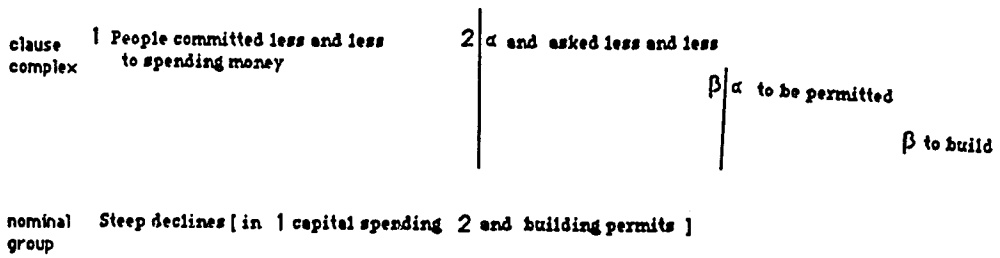


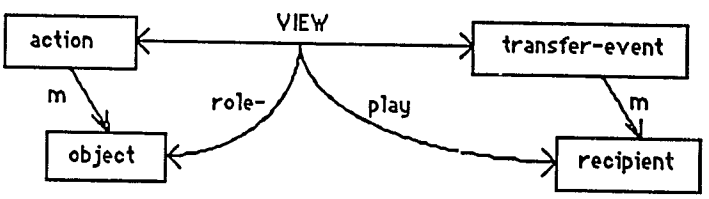
Fig. II:3.3-2: Clause complex and nominal group

The last rewording in the direction of a non-metaphorical mode of expression loses information represented in the economic interpretation of what has happened in the world. For instance, the notion of economic indicators as abstractions in the economic view of the world is no longer represented. But that is also the point: the resources of grammatical metaphor are needed in the field of economics.

A text of the kind just illustrated poses a number of problems for text generation; I have pointed to one issue, grammatical metaphor. At the same time, the text illustrates a writing task it might be very desirable to automate: the writing of regular reports based on a continuous flow of numerical data. (As noted in Chapter I, Kukich (1983) addressed this kind of task in her work on the stock market report generator Ana.)

3.3.2.2 Grammatical metaphor in work on text generation

While metaphor has received some discussion in computational linguistics as a problem for accounts of understanding (cf., for example, the contributions to the panel on metaphor at TINLAP-3 in Wilks, 1987), there has been very little work on grammatical metaphor as a problem in text generation. The only published exception may be Jacobs' work on PHRED and KING. Jacobs (1987) suggests that the relationship between pairs such as *Ali punched Frazier* and *Ali gave Frazier a punch* can be handled at the level of conceptual structure by means of a metaphorical VIEW relation between the two types of process. The VIEW represents the metaphor of action as transfer-event, in Jacobs' terms:



KEY:

m = manifest, a relation indicating the role of a concept
role-play = relation used to roles of different concepts
VIEW = a relation used to show correspondences between different concepts and their roles

Fig. II:3.3-3: Metaphorical VIEW adapted from Jacobs (1987)

According to this representation, an action is viewed as a transfer-event and the object of the action as the recipient of the transfer. The VIEW relation reflects the same type of correspondence that is embodied in the box diagram interpretation of a grammatical metaphor (as in Figure II3.3-1 above). For

instance, the metaphorical example *Ali gave Frazier a punch* can be diagrammed as follows.

Ali	gave	Frazier	a punch	
Actor	Process	Recipient	Goal	metaph.
Actor		Goal	Process	congr.
'Ali		(ii) Frazier	(i) punched'	

Fig. II:3.3-4: Metaphorical correspondence in box diagram

For most types of metaphor, it is important to take account of the fact that the metaphor represents more than one organization; the metaphor adds a perspective on the phenomenon being represented without replacing the congruent perspective. Thus, *Ali gave Frazier a punch* is similar to *Ali gave Frazier a rose* but it is also unlike it since it is a metaphor that embodies 'Ali punched Frazier'. For instance, *Ali gave a punch to Frazier* seems less likely than *Ali gave a rose to Frazier* (from a grammatical point of view). Similarly, we might have *Ali gave Frazier a punch yesterday on the nose* without necessarily having to interpret *a punch ... on the nose* as a discontinuous nominal group (cf. *Ali punched Frazier on the nose*). The general point is that the grammatical metaphor will typically show features of the congruent perspective as well as the metaphorical one.

The approach outlined by Jacobs may work for certain purposes for certain types of grammatical metaphor. However, there are a number of issues that

have to be addressed. (i) The VIEW relation represents the correspondence between two concepts and their roles, but it does not necessarily represent the meaning of the metaphorical view. For instance, what does it mean to view an 'action' as a 'transfer-event'? (ii) Similarly, how do we represent the conditions under which the metaphorical view is chosen over the congruent one? For instance, with examples such as punching, kicking, and socking, the crucial factor is arguably not that they are viewed as transfer-events but rather (i) that the process is represented as a participant and thus takes on the grammatical potential of a thing -- it is reified -- and (ii) that this leads to a textually significant reorganization of the clause as well. In particular, the process-as-participant can come last in the clause as unmarked new information (cf. Section II:3.2.6).

In what follows, I will not explore Jacobs' approach. Rather, I will take a step towards a survey of different types of grammatical metaphor. Such a step is necessary before we can propose a range of approaches to the problems of grammatical metaphor.

3.3.3 A typology of grammatical metaphors

The few examples of grammatical metaphors I have given so far have all been ideational. However, grammatical metaphors can be either interpersonal or ideational; and they can involve complexity / rank-shift or not (ranking metaphors). These types are exemplified in the table below and will be discussed in what follows.

	complexity-shifting		ranking	
	higher	lower	congruent	metaphorical
interpers.	MODALITY I suppose he left early ←	Maybe he left early	MOOD I have never lied to you. →	Have I ever lied to you?
ideational	He left before you arrived →	He left before your arrival	TRANSITIVITY I fell →	I had a fall
	That he had departed suprised me →	His departure suprised me		
	rank-shifting			

Fig. II:3.3-5: Examples of metaphors involving clauses

I will start with the distinction between ideational and interpersonal metaphors in Section II:3.3.3.1 and will then discuss the further subtypes of ideational metaphors shown in the table in Section II:3.3.3.3. The individual subtypes are discusses as follows:

decomplexing / downranking: Section II:3.3.4

complexity-shifting: Section II:3.3.4.3

rank-shifting: Section II:3.3.4.4

ranking: Section II:3.3.5

3.3.3.1 Ideational and interpersonal metaphor

Halliday (1985: 321) identifies two main types of grammatical metaphor in the clause:

(i) "metaphors of mood (including modality)", which are interpersonal; and

(ii) "metaphors of transitivity", which are ideational.

(i) Interpersonal metaphors provide strategies for alternative ways of achieving speech functions and modalities. Speech functional metaphors involve the reclassification of the mood used to achieve a speech function or a shift to a projecting clause complex. For instance, a command may be expressed as if it were a question and a statement modalized by probability can be presented as a projection of belief. Examples adapted from Halliday (1985) include:

(congruent:) `That pudding probably won't ever be cooked, will it?`
(metaphorical:) α: `I don't believe` || β: `that pudding will ever be cooked will it?`

(congruent:) `Is the position still available?` [tentative]
(metaphorical:) `I was wondering if the position is still available.`

(congruent:) `You shouldn't say such a thing.`
(metaphorical:) `How could you say such a thing?`

I have already mentioned metaphors of modality in Section II:3.2.6, in the context of the discussion of grammatical ambivalence and theme selection

'outside' the clause. For instance, a projecting clause complex may be interpretable as a metaphorical representation of a modalized clause, as in

`Shouldn't think he had much time left` (CEC, 153)

analyzed below:

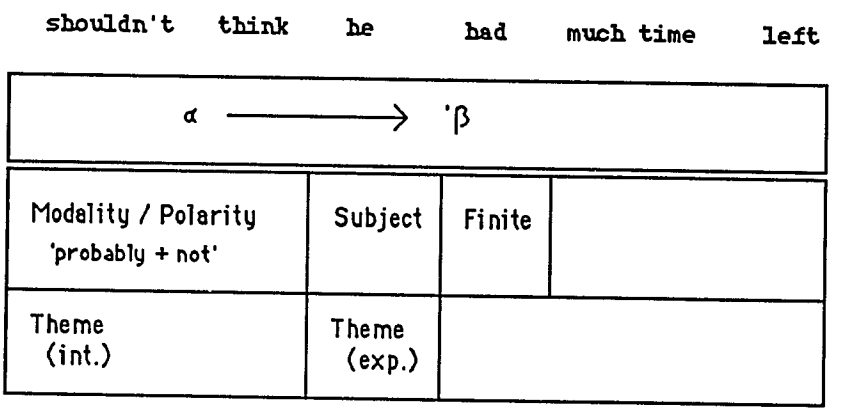


Fig. II:3.3-6: Interpersonal metaphor of modality

According to this analysis, the example is simultaneously a projecting clause complex and a modalized clause. Both perspectives tell us something about the example. For instance, the projecting clause still has the characteristics of a clause (selecting for mood, for polarity, for modality, for subject presumption [*shouldn't* instead of *I shouldn't*], etc.), even though it is a metaphorical modality. At the same time, the projected clause has the characteristics of an independent clause: it is not introduced by *that* as a dependent clause and it could have a Moodtag, while the projecting clause couldn't (*Shouldn't think he had much time left, had he?* -- not: *Shouldn't think he had much time left,*

should I?). Furthermore, the projecting clause as a modality serves as the interpersonal component of its Theme and the Subject as the experiential component. If we look at a longer extract, we can see how the twin themes of modality (/ cognition) and 'he' run through the text as interpersonal angle and topic:

> ... No. **He** got [n] brilliant first when **he** was twenty and it meant **he** couldn't graduate till **he** was twenty-one. They wouldn't give it to you and **he** stayed -- Did **he** stay at Oxford to do a postgrad year or did **he** come immediately here? *I can't remember*. **He**'s working for a Ph.D. here, *I think*, but *I think* **he** gets so involved in this computer business that *I don't know* how his Ph.D. is going. *Shouldn't think* **he** had much time left. ... (CEC. 153)

As **He**'s working for a Ph.D. here, *I think* shows, the modality-as-projection need not be thematic. One of the characteristics of interpersonal meanings is their potential for ***prosodic*** realization and one of the signs of the prosodic potential is that adjuncts of modality, attitude, and other interpersonal comments can be interpolated at various points in the clause (cf. Section II:3.2.5). Given that *I think* has a metaphorical status and is not a congruent projecting clause in a congruent projecting hypotactic clause complex, we can expect it to have the same sequential possibilities as a modality.[1] Thus, in addition to coming last, *I think* and similar expressions may also (like modalities in general) appear medially. Furthermore, as already noted in the section on interpersonal grammar, the various expressions of modality may combine in a prosodic fashion:

[1] We can expect 'prosodic' repetition based on the nature of projection itself. As noted by Halliday (1985: 228), we find repeated projecting clauses in speech to maintain the marking of passages as quoted. He also points out that some speakers mark this by means of an ongoing prosody of a special voice quality.

The first one *I think* was just for lecturer ... (CEC, 396)
it *shouldn't* be too bad an investment *I don't think* (CEC, 393)
No. *I think probably* there *might* be lots of copies of texts. (CEC, 809)

Speech functional metaphors have, of course, received a good deal of attention in speech act theory and have been interpreted as 'indirect' speech acts. But they are part of the phenomenon of grammatical metaphor in general and of interpersonal metaphors in particular. For instance, just like metaphors of modality, they are controlled by the tenor of the relationship between speaker and listener.

(ii) Ideational metaphors have already been illustrated in the preceding subsections and will be discussed at some length below.

The metaphorical representation adds another layer (at least) to the congruent one and there is a point of connection here between metaphorical layering and metafunctional layering. This connection seems to be particularly clear with the textual metafunction, since it is an enabling or second-order metafunction in relation to the ideational and interpersonal ones. (As we will see in the area of lexis, the textual resources can be seen as a second-order reinterpretation of the ideational taxonomic organization of vocabulary.) There are often textual reasons for choosing a metaphorical representation, but we can recognize a third type of metaphor whose function is completely textual:

(iii) metaphors of theme, which are textual: the experiential resource of relational transitivity is used to re-represent a clause to give it an alternative

thematic structure -- theme identification and theme predication (so-called pseudo-cleft and cleft clauses). An example involving theme identification is given below.

What	surprised	me	was	his attitude
Identified			Process	Identifier
(Phen)	Process	Senser		Phenomenon
	'surprised	me		his attitude'

Fig. II:3.3-7: Re-representation and theme-identification

The relational re-representation creates a new thematic grouping, the Identified element. In this respects it is like grammatical metaphors such as *Its observation takes place in the unanalyzable pattern of phenomena,* where the reified process is thematic (cf. the congruent: *it is observed,* where only the phenomenon of observation is thematic).

I will only discuss ideational metaphor in what follows.

3.3.3.2 Ravelli's categories of ideational metaphor

Ideational grammatical metaphor is often approached from a morphological perspective. Thus, nominalization is identified as the strategy that enables to represent a verb, an adjective, and so on, as if they were nouns. This observation is perfectly valid, of course. However, on the one hand, this word-rank phenomenon is merely the last step in the metaphor. The use of the noun *appointment* for the verb *appoint* follows from the use of the nominal group *the appointment of a new ambassador* for the clause *a new ambassador was appointed,* which in turn may follow from the use of the clause *the appointment of a new ambassador followed the thawing of the frosty relations* for the clause complex *a new ambassador was appointed after the frosty relations had thawed.*

On the other hand, not all grammatical metaphors are reflected in the structure of words. For instance, the following pair are congruent and metaphorical alternatives, although there is no 'derivation' at word rank:

(congruent:) The large producers and distributors played it safer than ever before <u>in nineteen eighty-seven</u>.
(metaphorical:) <u>Nineteen</u> eighty-seven saw the large producers and distributors playing it safer than ever before. (LA Reader)

The circumstance *in nineteen eighty-seven* is represented as a senser of a perceptive mental clause. (If there is a 'derivational' relationship here, it exists at group/phrase rank, between prepositional phrase and nominal group.) Similarly, when

I don't know the man who misplaced the prints

stands for 'I don't know who misplaced the prints', there is no morphological indication of a metaphor. Other examples include

Later I came to regret the old house 'the fact that I had bought / sold / etc. the old house'

It breaks her heart to see him suffer 'it saddens her'

As a first step in an account of ideational metaphor, let's consider ideational metaphors at group / phrase rank. Ravelli (1985) reports on a study of grammatical metaphor and mode. As an aid to her investigation, she constructs a typology of ideational grammatical metaphor, which she bases on a set of semantic categories such as process, participant, and circumstance; they will be discussed below in Section IV:2.3.1. She specifies congruent and metaphorical codings of these semantic types. For example, we can set up the following fragment of a semantic classification of phenomena and record the grammatical classes expressing them congruently and metaphorically.

semantic type of phenomenon			grammatical class: congruent	metaphorical
configurational phenomenon			clause (ranking)	clause (downranked)
simple phenom.	process		v. gp.	nom. gp; adjective
	participant		nom. gp.	nom. gp.; adjective
	circumstance		prep. phr.	adjective

Fig. II:3.3-8: Basis of Ravelli's typology of ideational metaphors

For example, the process of appointing is represented congruently by a verbal group but metaphorically by a nominal group:

process: 'appointing' ---

(congruent:) they <u>have appointed</u> a new ambassador

(metaphorical:) their <u>appointment</u> of a new ambassador

Ravelli's categories of grammatical metaphor are tabulated below with some minor adjustments. Since her work is based on a particular corpus, the typology is not intended to be exhaustive, but it gives a good sense of the range of grammatical metaphor. We will meet additional types in Sections II:3.3.4-5 below.

	Semantic choice		Congruent realization		Metaphorical realization		Examples
					function	class	
1.	process	a. material	verbal gp.		Thing	nom. gp.	the appointment of an ambassador
		b. mental					it changed our perception of the situation
		d. verbal					we had no talks last year
		c. relational					the sheer cost of it
2.					Epithet, Classif.	adjective	incoming Soviet missiles
3.	quality	of a thing	adjective		Thing	nom. gp.	peace through strength
		of a process	adverb				a sense of security
					Epithet, Classif.	adjective	its intrinsic worth
4.	modality	indicative	adverb (modal)	[modal aux.]	Epithet	adjective	the possible outcome
					Thing	nom. gp.	[the possibility of the outcome]
		imperative	passive vb.				[the obligation to do one's duty]
5.	logical rel	(rel. + configuration)	conjunction		Thing	nom. gp.	for that reason
					Process	v. gp.	the arms race contains the threat
6.	circ /	(rel. + part.)	preposition		Process	v.gp.	night follows day
7.	participant		nom. gp.		Classif.	adjective	economic development
					Thing	nom. gp.	the art of generalship
8.	configuration	expansion	clause (ranking)		Head, Qualif.	clause (down-ranked)	WWIII is more likely than peace breaking out
		projection					all it can do is to retaliate
9.	circumstance		prep. phr.		Epithet, Classif.	adjective	historical experience

Fig. II:3.3-9: Ravelli's typology of grammatical metaphors

As an examination of the typology represented in the table shows, apart from type 8, the highest rank of congruent coding in Ravelli's typology is the group. I will start with cases where the clause complex is the congruent coding in Section II:3.3.4.

The dominant metaphorical strategy is the nominal group; it is the resource for reifying or objectifying categories other than things. It is the metaphorical equivalent of the clause. The verbal group is only used as a metaphorical strategy for representing logical relations -- the circumstantial type of relation in relational transitivity.

Ravelli does not look at the congruent realizations and the corresponding metaphors in their grammatical contexts. It is not necessary for her purpose but it is the next step we need to take in the move towards an account of grammatical metaphor for the purposes of generation, since different contexts may require different strategies for handling metaphor in generation. For instance, type 1 -- clause as nominal group -- can occur in a number of different contexts. The congruent coding may be a clause complex corresponding to a simple clause in which one of the clauses of the complex is represented as the nominal group complement in a prepositional phrase serving as a circumstance:

(α:) Let's discuss the question (β:) after a new ambassador has been appointed ~
Let's discuss the question after [the appointment of a new ambassador]

The congruent coding may be a clause in which another clause serves as a participant and the metaphorical version may represent this second clause as a nominal group. The congruent rankshifted clause may be either a finite one, representing a fact, or a non-finite one, representing an act; the distinction is neutralized in the metaphorical nominal group:

[[That a new ambassador has been appointed]] surprises me
~
The appointment of a new ambassador surprises me

[[Appointing a new ambassador]] is a difficult task ~
The appointment of a new ambassador is a difficult task

The congruent realization may be a clause, part of which is represented metaphorically as a nominal group together with e.g. an expression of phase:

They (α:) put off (β:) <u>appointing a new ambassador</u> ~
They put off <u>the appointment of a new ambassador</u>

<u>A new ambassador</u> was <u>appointed</u> in July ~
<u>The appointment of a new ambassador</u> *came* in July

As we will see, there are other possibilities as well, but these examples serve to indicate the range of contexts.

3.3.3.3 A simple typology of ideational metaphor

Asking how metaphor enters into the generation process and where choices may be affected means looking for the first context in which the decision whether to use a metaphor has to be made. This suggests the clause complex as the starting point.

If we take as the basic question how ideational grammatical metaphors affect generation, it is natural to make an initial distinction between those metaphors where the metaphorical coding occurs at a lower rank or lower degree of complexity within the grammar and those where it occurs at the same rank:

(i) Rank (complexity) shifting (= lowering) **metaphors:** metaphorical coding at lower rank / complexity than congruent coding. In particular: clause complex as a clause and clause as a nominal group. A shift in complexity always also entails a shift in rank: if a clause complex is represented as a clause, one or more of the clauses of the complex will be represented as nominal groups.

(ii) Ranking metaphors: metaphorical coding at the same rank as the congruent coding. For example: Process coded as Process + Range.

These two types will be discussed in Sections II:3.3.4 and II:3.3.5 in more detail. Here I will just illustrate them briefly.

(i) Complexity- / rank-shifting metaphors. Consider the following example.

When he was elevated to the throne in 1851, King Mongkut was forty-seven years old.

The example is an enhancing hypotactic clause complex; a temporal dependent clause precedes its dominant clause. There is a metaphorical version: the clause complex is represented as a simple clause, with the

dependent clause represented as a nominal group serving as a constituent circumstance in the dominant clause:

> On his elevation to the throne in 1851, King Mongkut was forty-seven years old. (Wyatt)

These examples represent two coding alternatives, a clause complex (congruent) and a simple clause (metaphorical). The alternatives are diagrammed below.

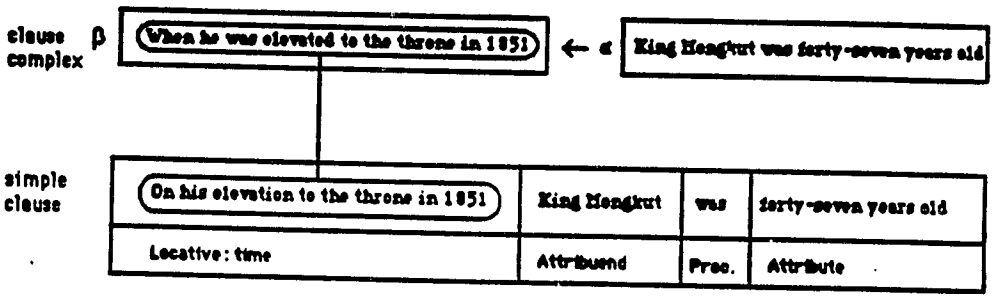


Fig. II:3.3-10: Rank/complexity shifting metaphor

(ii) Ranking metaphors. Now, let me illustrate the second type. Consider the following congruent clause:

> Luckily, when he fell, she happened to come by and find him.

In the clause *when he fell,* the process of falling is represented as Process: 'fell'. In the metaphorical alternative, it is represented as Process: 'had' + Range: 'fall'

Luckily, when he took a fall, she happened to come by and find him. (LAT)

The alternation is internal to the clause:

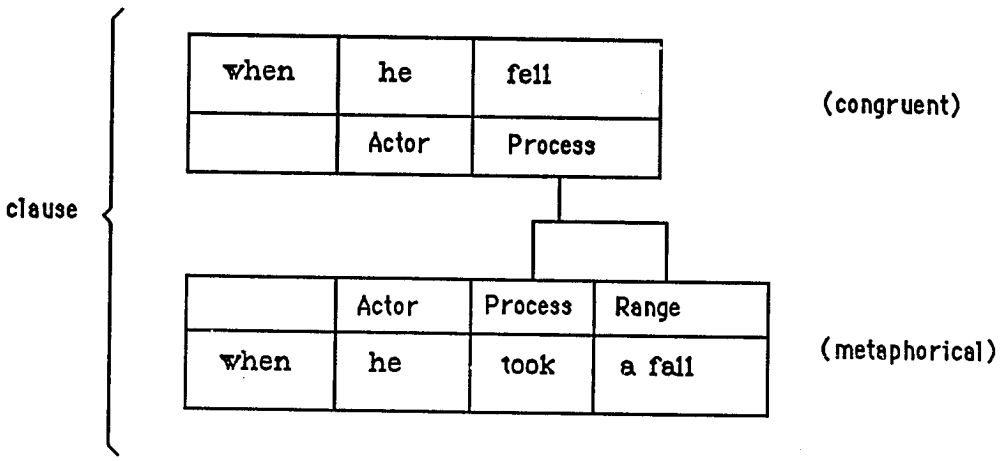


Fig. II:3.3-11: Ranking metaphor

As we will see, the distinction between the two types of metaphor is a useful one to make when we consider ways of handling grammatical metaphor in generation.

(i) With the first type, the grammar allows us to differentiate the congruent and metaphorical alternatives by context (complexity or rank) such as clause complex vs. clause and clause vs. nominal group. It is thus possible to side-step the need to reconcile and integrate the two representations.

(ii) With the second type, however, the two alternatives occur in the same grammatical context, such as the clause, and we have to address the question of how they might interact.

3.3.3.4 Reasons for metaphorizing

There are a variety of factors that come into play in the choice between a metaphorical coding and a congruent one. This is an area where much work remains to be done and I will only make a few general remarks. We can look at the question of the choice either in terms of contextual conditioning or from within the linguistic system itself. The two are complementary perspectives and are related: a particular type of context will lead to the choice of grammatical metaphors because of the characteristics they have within the linguistic system itself.

Contextual considerations are discussed in e.g. Halliday (198 , 1985), Ravelli (1985), and Martin (1986). They include registerial differences (cf. Section II:3.3.2 above). There is a very general difference between typical spoken language and typical written language. Halliday (1985) observes that certain (ideational) metaphors are particularly characteristic of speech, for example the type *make a mistake* (general verb + process noun), others are equally characteristic of speech and writing, but that "this kind of cross-coding is particularly characteristic of written language".

Turning to the linguistic system itself, we can explore the metafunctional consequences of the metaphorical mode of expression. Halliday (1967/77) points to ideational and textual considerations. In addition to these two, I think there are interpersonal considerations as well.

(i) Ideational considerations. Halliday (1967/ 77: 14) observes:

> When processes, qualities, states, relations, or attributes are 'objectified' they take on the potentialities otherwise reserved to persons and objects.

For instance, objects can easily be counted, be referred to repeatedly once established in a discourse, and be given a range of different properties. At the same time, the objectification of a process makes it possible to leave the participants out of the representation -- a possibility that is often taken up. For instance, in the following example, the metaphorical strategy allows talk to exist without any specific talkers (making up for the lack of impersonal passives in English):

> There was endless *talk* of recipes for wedding-cakes, of patterns of wedding-dresses and of printers who would have to be consulted about suitable invitation cards.
> (Farrell, The Singapore Grip, p. 304)

In general, the differences between the resources of a clause complex and those of a clause and the differences between the resources of a clause and those of a nominal group helps determine the choice between metaphorical and congruent representations.

(ii) Textual considerations. Halliday (1967/ 77: 14) observes:

> Now the English clause is structured not only in terms of participant roles but also, and independently, along a different dimension in which roles, or functions, are assigned as components of a message. There is a 'theme' -

what is being talked about; a 'focus' - what is being presented as the main item of information; and so on. These roles are freely combinable with those of affected, causer and the like, so that any nominal element can take on any of them; but they are not at all freely combinable with the functions of non-nominal elements in the clause. There are thus more different ways of structuring the information in a clause like *the announcement of his resignation put an end tc the discussion* than there are in, for example, *because it was announced that he had resigned they stopped discussing.*

For instance, the nominalization *this proposal* in the following examples allows the writers to summarize the previous discussion as the theme:

> In place of the monolithic unity of the paradigm, which is able to change only by being cracked and shattered in a revolution, would stand a form of unity in plurality. This proposal, of a creative plurality in scientific ideas and theories, does, however raise a significant question: ... (Bohm & Peat)

Similarly, in the following news item, *the withdrawal* serves to refer back to a process of withdrawing and, once the withdrawal has been established in the discourse, it can be picked up again:

> The U.S.-backed Nicaragua rebels are planning to *withdraw* most of their troops from Nicaragua in the wake of Congress' vote last week to halt their funding, Reagan Administration officials and Contra sources said Friday.
>
> *The withdrawal*, which would represent a virtual collapse of the Contras' military effort, has not been ordered yet, the officials said. But it will begin soon unless the rebels receive a new infusion of money, food and other aid, they said. ... (LAT)

(iii) Interpersonal considerations. Finally, the interpersonal metafunction is involved in grammatical metaphor. A finite clause is, in principle, arguable;[2] the listener can accept or not, comply or not, and so on. This is what is embodied in the Mood function of the clause: if the speaker says *Henry did,* the listener may agree or disagree -- *he did; he didn't.* Grammatical metaphor brings about a change in arguability; a clause re-represented as a nominal group is no longer arguable. For instance, we can argue with the statement *It has validly been observed (that a great deal can be learned ...)* -- *Yes, it has; no, it hasn't.* But the corresponding nominalization *a valid observation* is not open to immediate argument; in the following example, it is simply presented as something to be taken for granted:

> *A* <u>*valid*</u> *observation* ⟦*that has frequently been made (and often irrationally denied)*⟧ is that a great deal can be learned about UG from the study of a single language, if such study achieves sufficient depth to put forth rules and principles that have explanatory force but are underdetermined by evidence available to the language learner. (Chomsky, GB, p. 7)

The nominalization strategy also makes it possible to present information that is not directly arguable in a qualifying relative clause (... *and often irrationally denied*).

[2] The notion of arguability is Halliday's (cf. 1985: ch. 4); Givón's (1979) notion of challengeability is similar. I say that finite clauses are arguable -- in principle, because rankshifted clauses such as relative clauses serving as postmodifier or head are not directly arguable; they are to be taken for granted.

3.3.4 Decomplexing / downranking metaphors

The two most important types of complexity / rankshifting metaphors are clause complexes coded as clauses and clauses coded as nominal groups. There are two perspectives on rankshifting metaphors from within the grammar itself:

(i) They constitute part of the paradigm of semantic types recurrent throughout the grammatical system.
(ii) They constitute one type of use of the rank scale.

The first applies to complexity and rank shifting metaphors and the second to metaphors involving rankshift (whether or not a shift in complexity is involved).

3.3.4.1 Recurrent semantic types and 'transcendent' choices

The rankshifting type of ideational metaphor is akin to the recurrence of certain semantic types throughout the grammatical system in a certain respect: it makes possible the expression of similar relations at lower ranks. I will give (i) an example of the semantic type of extension and then (ii) one of elaboration. Grammatical metaphor extends the paradigm for (iii) enhancement and (iv) projection.

(i) Extension. Consider the extending relation of replacement, which may hold between two clauses in a clause complex or between two nominal groups

in a nominal group complex. The examples below illustrate that if Henry went to the meeting but did not go to the party, there are two agnate ways of expressing this.

clause complex	Instead of going to the party, Henry went to the meeting
nominal group complex	Henry went to the meeting, instead of the party

Fig. II:3.3-12: 'Transcendant' alternation

Although the two examples are agnate, they cannot be represented as systemic alternatives, since they are alternatives in different grammatical contexts --- the clause complex and the nominal group complex.[3] The following pair illustrates the same phenomenon. Both examples involve the relation of extension. In the original, it is expressed by means of a circumstance of accompaniment and in the paraphrase by means of an extension of the Subject nominal group to a nominal group complex:

clause: accompaniment

Hellenistic philosophy was united [Accompaniment:] *with the mystical tradition of the East*. (Tillich, p. 68)

[3] Agnate alternatives within clause complexing are, of course, related systemically. Thus the hypotactic combination *instead of going to the party, Henry went to the meeting* is related systemically to the paratactic version *Henry did not go to the party; instead / but he went to the meeting.*

nominal group: extending complex

[1] Hellenistic philosophy [2=] *and the mystical tradition of the East* were united.

Again, these cannot be represented as systemic alternatives, since their grammatical contexts are different --- clause (simplex) and nominal group (complex).

Cases such as the two pairs just mentioned arise because of the existence of semantic types that recur throughout the grammatical system. The semantic types are the basis for the agnation and their spread throughout the grammatical system in different contexts is the reason why the agnations cannot be accounted for in a simple way by means of systems.

Rather than thinking of the recurrence as a systemic alternation, we can treat it as repeated opportunities for coding certain relations. These opportunities are encountered on the generation path through the grammar. Assume that there is a demand to express the unification of Hellenistic philosophy and mystical eastern traditions. The first potential opportunity is the clause complex, more specifically an extending clause complex:

Hellenistic philosophy was united and the mystical tradition of the East were united

This strategy is not appropriate for the example, since it involves one process of unification rather than two processes where one is extended by the other, so the strategy is not chosen and the expressive demand remain to be taken care

of. The second opportunity comes in the simple clause; the relation of extension can be represented as accompaniment:

Hellenistic philosophy was united with the mystical traditions of the East.

This is the strategy chosen by the writer. If it had not been chosen, the expressive demand would still remain. The third opportunity presents itself at group rank, in the form of an extending nominal group complex:

Hellenistic philosophy and the mystical traditions of the East were united.

(Finally, we might also include a simple nominal group as a strategy:

The two traditions were united.)

The alternatives are summarized diagrammatically below.

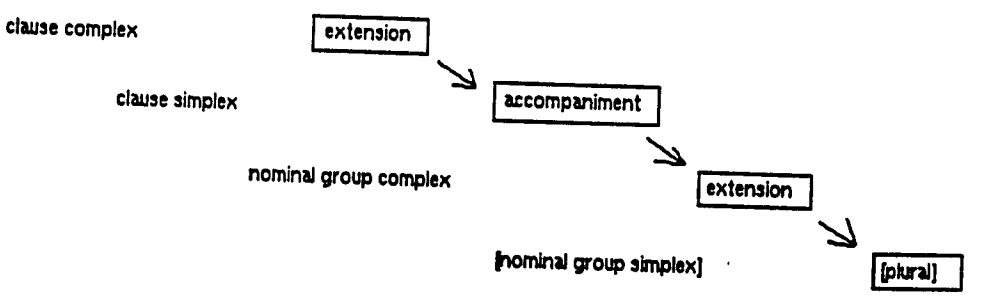


Fig. II:3.3-13: Recurrent opportunities to express 'extension' in traversal of the grammar

(ii) Elaboration. The relation of elaboration occurs in the formation of clause complexes as well as in the formation of group complexes. In the following example contrasting Aristotle and Augustine, this relation is used to elaborate on 'inductive thinker' and 'intuitive thinker', one of the points of contrast between the two men:

> [1 Aristotle was [nom.gp. 1 an inductive thinker, 2= an empiricist]. 2= He started from the given reality in time and space and went up from there to the highest abstractions.] [clause 1 Augustine, following Plato, as an intuitive thinker; 2= he started from above and went down to the empirical realities.] (Tillich, p. 111)

We also saw examples of Halliday's observation that elaboration is one of the relation types in relational clauses in addition to being one of the ways in which complexes are formed. To return to the earlier example, we can gloss the name of a dinosaur either by means of a complex, at clause or group rank, or by means of a relational clause:

complex	**simplex**
clause: complex: elaborating	
[Ankylosaurus, which means the "fused lizard", was the largest of the ankylosaurs.]	

clause: relational: intensive

Antarctosaurus means "not northern lizard".

nominal group: complex: elaborating

Ankylosaurus - the "fused lizard" - was the largest of the ankylosaurs

As an example proceeds through the grammar, there are, then, a number of opportunities to express extension and elaboration. In the extension example just discussed, the second opportunity was selected. In general, the expression of one of the semantic types such as extension may be *'delayed'* from one opportunity to another.

Various factors influence the choice of when to express the semantic relation. In the case of extension, these factors include questions such as

(i) **participation & occurrence:** if participants are related by extension, do they take part in the same occurrence (token) of a process or not or merely in the same type of process?

(ii) **thematicity:** do the participants have the same thematic status or is one thematic and one rhematic?

(iii) **information status:** do the participants have the same information status or is one given whereas another is new?

In the example used above, 'Hellenistic philosophy' and 'mystical traditions of the East' have different thematic status, as is clear when the example is quoted in context --- only 'Hellenistic philosophy' is topical locally, having been mentioned in the previous sentence:

> This is both philosophy and mysticism. It is Hellenistic and not classical Greek philosophy. Hellenistic philosophy was united with the mystical traditions of the East.

We need to explore how these factors are taken into account, how the generation process can be made to choose according to them, but for present purposes the two central points are the observation about repeated coding opportunities in the path through the grammar and the possibility of delaying the expression of an expressive demand.

Extension and elaboration are two of the three types of expansion; and beyond expansion, there is also projection. Thanks to grammatical metaphor, we can add (iii) enhancement and (iv) projection to the list of alternative representations.

(iii) Enhancement. We can now see how rankshifting metaphors fill out the paradigm of the enhancing type of expansion, giving us simple relational clauses of an enhancing kind:

clause complex: enhancing

We left the party before Henry arrived

clause: relational: circumstantial

Our departure preceded Henry's arrival

In this example, an enhancing clause complex is coded as a circumstantial relational clause.

(iv) Projection. Similarly, a projecting clause complex may be represented as a clause, with the projected clause downranked as a nominal group serving in what corresponds to the projecting clause:

(clause complex:) Webster ordered the CIA's former Costa Rica station chief to be dismissed ~

(clause:) Webster ordered the *dismissal* of the CIA's former Costa Rica station chief ... (LAT)

This type of rankshifting metaphor involves the same issue of non-adjacent agnation pairs that we find with the recurrent semantic types in general:

There are agnation pairs where the members belong to different ranks or complexity types and thus cannot be represented as a systemic alternation in the same part of the network; for example, *We left the party before Henry arrived* (expanding clause complex) ~ *We left the party before Henry's arrival.*

Let me illustrate the representational problems in more detail. Consider again the pair *We left the party before Henry arrived* and *We left the party before Henry's arrival.* The first is a hypotactic clause complex and is agnate with paratactic clause complexes such as *we left the party and then Henry arrived* in the Nigel grammar. The second is a simple clause and is not agnate with clause complexes, neither hypotactic nor paratactic ones. Once we have chosen a simple clause rather than a complex one, we will not be offered *we left the party before Henry arrived* as a systemic alternative to *we left the party before Henry's arrival:*

clause complex →	paratactic	We left the party || and then Henry arrived
	hypotactic	We left the party || before Henry arrived
clause : ... :	locative: temoral	We left the party before Henry's arrival
		We left the party before eight

Fig. II:3.3-14: Non-adjacent agnation pair

The problem is how to represent the alternation across the differentiation between clause complex and clause. One approach is to use the strategy of ***'delayed' coding*** discussed below, which is what the relationship to recurrent semantic types suggests.

3.3.4.2 Complexity-shifting metaphors as delayed coding

In the case of a complexity-shifting metaphor, the first opportunity for lexicogrammatical coding is the congruent one if the generation algorithm is of the general design outlined in Section II:1.2.1.6. To get the generation grammar to handle the metaphorical alternative, we can explore either of two designs at this stage in the generation process. Assume that a 'message' is to be expressed grammatically:

(i) The congruent coding is generated and it is then mapped onto the metaphorical coding at a lower degree of complexity.

(ii) The option of developing the congruent coding is not chosen. Instead, the task of coding the message is delayed until the degree of complexity where the metaphorical coding is developed.

(i) The first alternative demands more of the grammar, since it would have to integrate selections and structures from two different traversals through different parts of the grammar. We would have to write new grammatical specifications to handle the integration. It is quite possible that that is precisely what is needed to achieve a balanced account of rankshifting metaphors, but it makes good sense to explore the second alternative first to see how far it will take us.

(ii) According to the second alternative, we can treat the metaphorical representation as a delay in the coding in relation to the congruent one. There are, in principle, two ways of allowing for the option of 'delay'. We can state it (a)

as an option in the grammatical system network; or (b) by means of the semantics controlling choices in the grammar.

(a) We can build the choice between a congruent and metaphorical representation into the grammar in the case of clause complexes, as illustrated in the system network below.

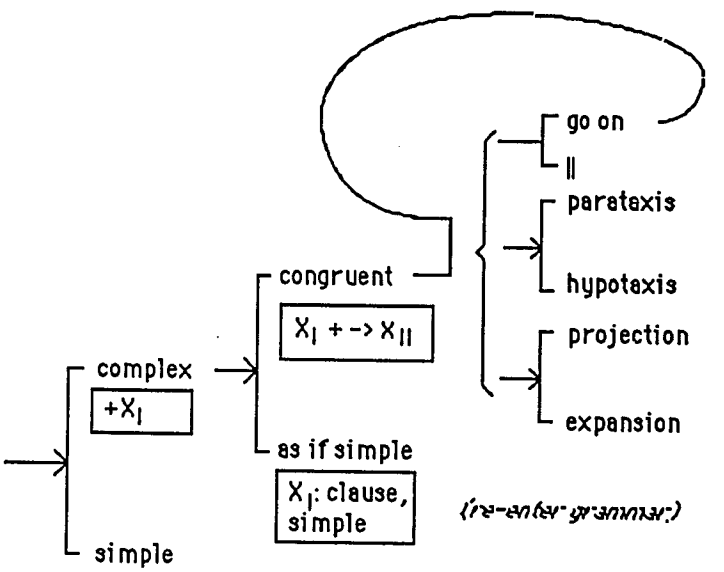


Fig. II:3.3-15: 'Delay' as option in grammatical system network

If it is established that the clause is complex, the systemic consequences are delayed in the system network until it has been established whether the complex is to be represented congruently or metaphorically ('as if simple'). If the metaphorical option is chosen, the grammar is re-entered to develop a metaphorical simple clause. This re-entry represents the delay from complex (congruent) to simplex (metaphorical).

(b) Alternatively, we can represent the alternation between the congruent and metaphorical options entirely within the semantics. The semantics establishes a distinction between sequences, congruently represented by clause complexes, and configurations, congruently represented by clauses. In the case of a sequence, the further distinction between congruent sequences and sequences represented as if they were configurations is drawn. The preselections in the grammar are postponed until it has been established whether the grammatical realization is congruent or metaphorical:

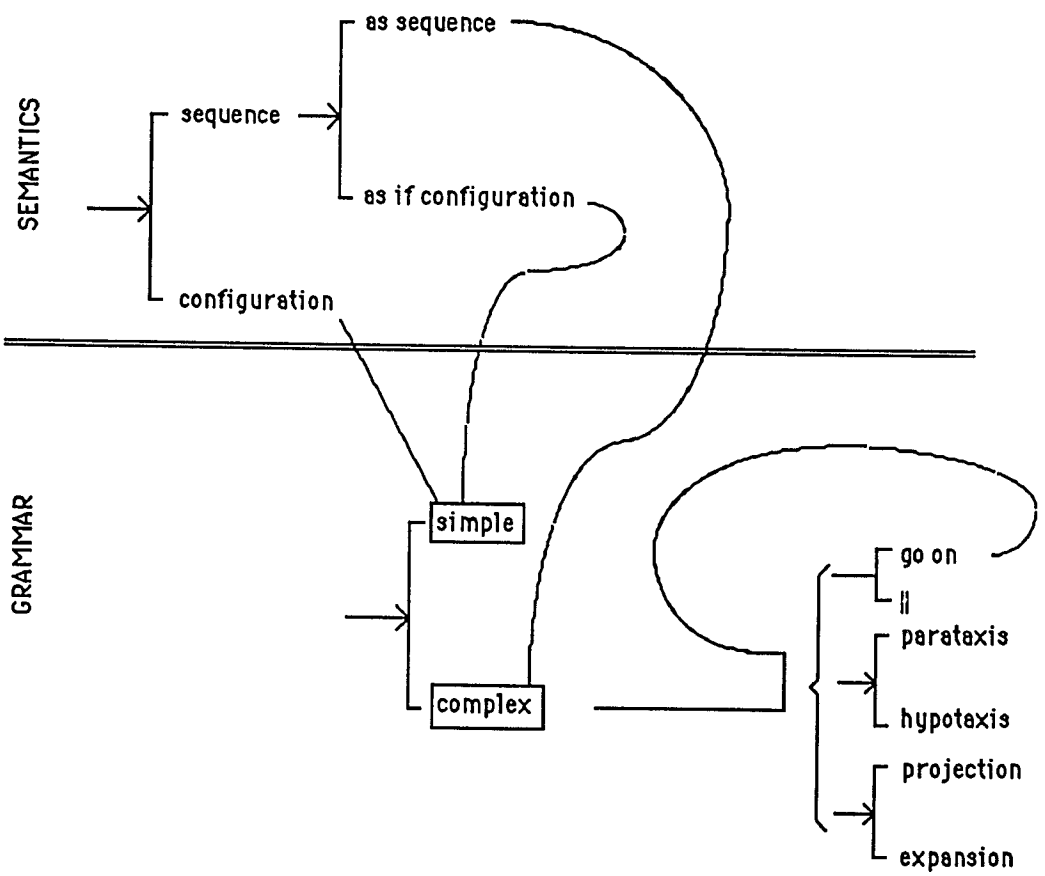


Fig. II:3.3-16: Metaphor as entirely semantic alternative

The semantic distinctions here are simply stated in terms of experiential categories such as 'sequence' and 'configuration'. We may want to include further experiential considerations in the semantics to anticipate the consequences of choosing one alternative over another (such as the possibility of dispensing with the representation of participants); we may also want to include textual and interpersonal considerations.

In both cases, (a) and (b), the correspondences between messages realized by the clauses of the clause complex and the parts of the clause metaphor must be kept track of outside the grammar, at the semantic stratum. As they stand, there is probably little to choose between the two alternative approaches. However, the second approach can be developed further to allow for sharing of semantic resources between congruent clause complexes and metaphorical clauses.

I will now look at metaphorically expressed clause complexes.

3.3.4.3 Brief survey of the clause complex as starting point

Since the metaphorical alternatives for expansions and projections are partially different, I will discuss them separately:

(I) Expansion: Section II: 3.3.4.3.1; and

(II) Projection: Section II: 3.3.4.3.2.

3.3.4.3.1 Expansion

Unless the clause complex is rankshifted, a clause complex can only be represented metaphorically as a clause. If it is rankshifted, it can also be represented as a nominal group.

(1) Clause complex as simple clause

There are two principal delayed coding alternatives. To illustrate, I'll take an enhancing clause complex as the first coding opportunity: *we collected the five texts; then we analysed them*(or: *we collected the five texts before we analysed them*). Either

(i) one clause is downranked as a circumstance, realized as a prepositional phrase with the conjunctive relation being represented by the preposition: *we collected the five texts before our analysis of them*; or

(ii) both clauses are downranked as participants, realized by nominal groups with the conjunctive relation being represented by a circumstantial relational process: *our collection of the five texts preceded our analysis of them.*

The possibilities are summarized schematically below.

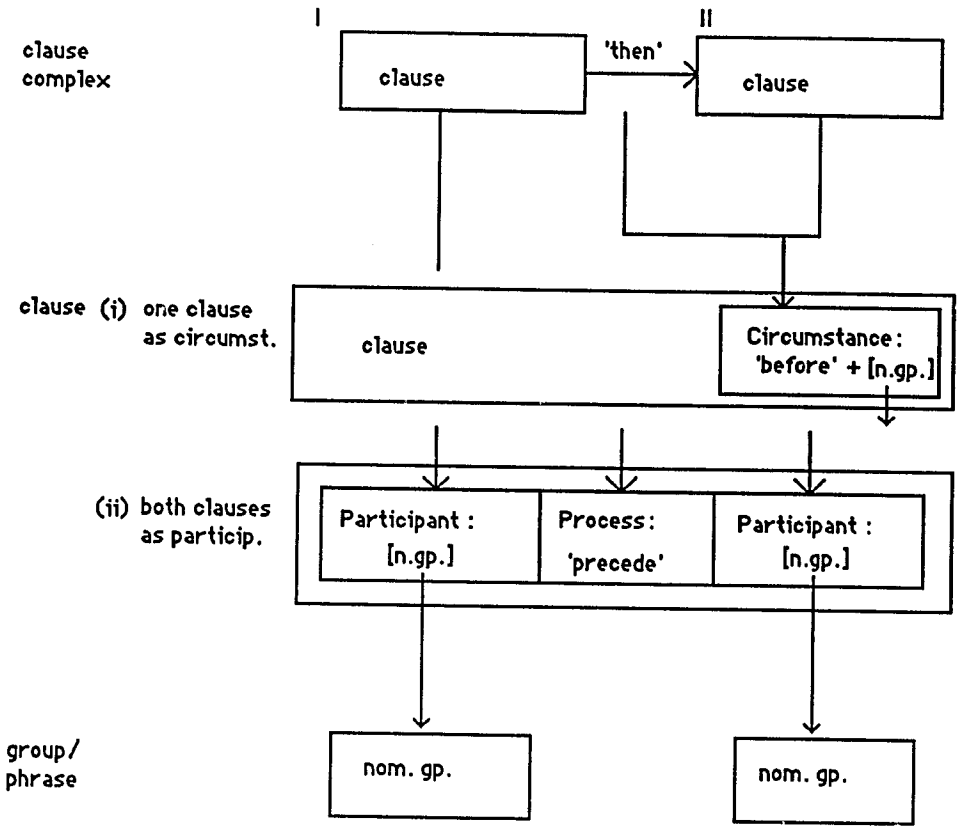


Fig. II:3.3-17: Complexity-shifting metaphors

(i) One clause as circumstance. Only one of the clauses of the complex is downranked, viz. the clause that would correspond to the dependent clause in the congruent clause complex, in which case it is represented as a prepositional phrase serving as a circumstance in the other clause:

We departed before Henry's arrival

This strategy is open to enhancement and extension but not to elaboration. That is, there is no circumstance such that it can represent an elaborating clause.[4]

(ii) Complex as relational clause. The clause complex as a whole is downranked, yielding a circumstantial relational clause with the clauses of the complex as nominal groups and the conjunction as a relational verbal group:

Our departure preceded Henry's arrival

Since the conjunctive relation is represented by a verbal group, tense, modality, and so on can be specified. A modality of a consequent clause may be transferred to the verbal group expressing the conjunctive relation:

Weakness in farm and interest income ... <u>should</u> cause a further slowing in income growth. (FRB) i.e.,

'Farm and interest income are weak || so income growth <u>should</u> slow further'

Here are examples of verbs serving to express the conjunctive relation realized by a conjunction in a clause complex.

[4] The circumstance of elaboration is Role; but although the role relation of 'as' is an elaborating one, Role cannot serve as a metaphorical representation of an elaborating clause.

		congruent: conjunction	metaphorical: verb
enhancement	cause	so, ... because, since, as, for, ...	cause, lead to, produce, insure, result in /from,
	time	then, ... before, after,	follow, precede, greet,
extension	addition	and, ...	accompany, attend,
elaboration	'i.e'	i.e.	mean, represent,

Fig. II:3.3-18: Verbs expressing conjunctive relations

We find examples from all the major types of expanding clause complexes.

(1) enhancement

(i) as circumstance

(a) time

succession: 'after'

and, *after* some prodding, Sarit's deputy, General Thanom Kittikachorn, took the post as an obvious stand-in for the absent Sarit. (Wyatt, 280)

When two spinning particles collide, the direction of their spin can affect how they scatter, just as the "english" on billiard balls can alter their rebound *after collision*. (Krisch, 42)

After a laborious, six-year modification of another accelerator, the Alternating Gradient Synchrotron (AGS) at the Brookhaven National Laboratory, we have now been able to investigate the effects of proton spin at much higher energies: ... (Krisch, 42)

same time: 'when'

On his elevation to the throne in 1851, King Mongkut (Rama IV) was forty-seven years old and had been a Buddhist monk for twenty-seven years. (Wyatt, 182)

The results demonstrated that spin plays a significant role *in high-energy interactions between protons:* (Krisch, 42)
During the late 1920's and the 1930's, however, spin became an important element *in the development of quantum mechanics and atomic physics, particularly in the work of P.A.M. Dirac.* (Krisch, 42)

During the 1940's nuclear physicists believed that spin effects were felt only *in low-energy atomic collisions* and that they could not possibly be significant *in nuclear collisions at several million electron volts of energy.*Then Charles L. Oxley of the University of Rochester and his colleagues found evidence of large spin effects *in collisions at several hundred million electron volts.* (Krisch, 42)

Most high-energy physicists were quite sure that spin would be unimportant *in elementary-particle collisions.* (Krisch, 42)

in an inelastic collision some of the energy goes into creating new particles (Krisch, 43)

(b) cause

purpose:

He returned to Bangkok *for* a bit of schooling. (Wyatt, 279)
'to be schooled'

Matthew had sloped off *for a chat with Kate* and perhaps was even hoping to make it up with Joan. (Farrell, p. 356)

concession:

Despite the release this year of about 200 Soviet political prisoners, the pace of releases has slowed in recent times. (LAT) 'although about 200 .. were released this year'

Despite a sharp drop in purchases of foreign energy supplies, import growth edged up. (FRB)

result:

He was 31 when police interrogators beat him *to* death (Mother Jones) 'beat him so that he died' [also relatable to a resultative Attribute: 'beat him dead']

(c) manner

The Wu Li Master does not speak of gravity until the student stands *in* wonder at the flower petal falling to the ground.(Zukav, p. 34)

(ii) relational clause: circumstantial

(a) time

He lay there quaking for some moments with his head in his hands, flinching as one aeroplane after another roared overhead, each one followed by a series of resonant explosions which shook the ground and created a miniature landslide of pebbles of a few inches in front of his nose. (Farrell, p. 289-90)

A faint snicker *greeted* this remark (Farrell, p. 408)

(b) cause

A surprisingly sharp drop in the index of net business formation and a decline in new orders for consumer goods *account for* most of March's unexpected weakness in leading composite. (FRB)

The departure of gamma *unleashes* the catalytic activity of phosphodiesterase. (Sci Am)

There is another possibility with cause. The antecedent clause may be represented as the Agent of the consequent clause. The causal chain is thus abbreviated: 'x occurs so y occurs' becomes 'the occurrence of x makes y occur'. Often this entails an alternation from middle to effective in the consequent clause. For instance:

> Most of the rocks were deposited as beds, or strata, which were originally horizontal; since then, however, *pressures* in the earth's crust have *flexed* them into various positions, so that they are now inclined at all conceivable angles. (Logan, 54) 'pressing so they flexed [middle]'

> Erosion over great lengths of geological time *wore away* all of the upper portion of this anticline, reducing the entire area to a nearly level surface, often termed a "peneplain." (Logan, 54) 'eroding so the upper portion wore away [middle]'

> Much later, internal pressures once again *bowed* the area upward, ... (Logan, 54) 'pressing internally so the area bowed upward [middle]'

also:

> This streamless gap has *resulted from* the relatively easy *erosion* of certain weak beds, which constituted the geology of this portion of the mountains.(Logan, 54) 'certain weak beds eroded so this streamless gap has resulted [middle]'

(2) extension

(i) as circumstance of accompaniment

> ... Sarit emphasized that he was acting on behalf of the people and *with* their *support*. (Wyatt, 279)

> The drop in nonresidential outlays -- the first in 9 months -- was broadly based, *with* sharp *declines* in industrial and office construction. (FRB)

He added *with* a *smile*. (Christie, 35)

(ii) relational: circumstantial: accompaniment

Numerous *changes* *accompanied* these *developments* (Wyatt, 215)

But there was still something that the young man from Blackett and Webb wanted to show him before he went and the Major, protesting weakly, allowed himself to be diverted towards one or two floats which had been designed to portray the social benefits which had *attended* these fifty years of successful commerce. (Farrell, p. 360)

(3) elaboration

(i) relational: intensive & equative

This is a way of presenting an interpretation of a process.

Like some of them, his *accession* to power *represented* a generational *change*, in this case, the rise of a generation of leaders unique in twentieth-century Thailand. (Wyatt, 279) 'he acceded to power; generations changed'

In the example above, both clauses of the complex are nominalized; alternatively, only one clause of the clause complex may be nominalized, while the other is rankshifted clause:

The subsequent rapid *decline* of the cross section *means* [[that at low energies the protons only glance off each other]]; ... The subsequent gradual *decline* of the cross section *suggests* [[that high-energy collisions involve hard objects inside the proton]]. (Krisch, 44)

Cf. also, with one participant realized by a congruent nominal group; in the following example, mountains are represented as a reified process:

In a general way, the mountains *represent* a great *upfolding* of these strata to form a gigantic arch, or

"anticline." (Logan, 54)

(ii) relational: intensive & ascriptive

The *conclusion* of the Burney Treaty *was* important in a number of ways. (Wyatt, 169) 'the Burney Treaty was concluded, which was important in a number of ways'

In examples such as the one above, the congruent rewording involves a reference whose scope extends beyond a participant.

(2) Clause complex as nominal group

If a clause complex is rankshifted, certain types can be represented as nominal groups. The general type of the complex is represented as the Thing, realized by a noun such as *combination, contrast, alternation,* and *replacement;* for instance:

The *combination* of strong *shipments* and sluggish *orders* suggests that the surprisingly brisk delivery pace is coming out of backlogs of unfilled orders. (FRB)

Tailpiece

In addition to the type of decomplexing metaphors discussed above, we may also consider the possibility that a hypotactic conditional enhancing clause complex may be represented as a simple clause in which the conditioning clause is represented as a postmodifier in a nominal group; for instance:

(1) As part of that review, OFCCP has asked that all employees ⟦who wish to be interviewed or to comment about UCLA's compliance with its obligations⟧ contact

the OFCCP office. (2) α: Employee organizations, <β: if they wish to be interviewed >, may also contact that office. (UCLA office memo)

From a rhetorical point of view, this extract presents two conditional proposals, (1) and (2). The second one represents the conditioning congruently as a hypotactic conditional clause complex. However, the first proposal is arguably a grammatical metaphor. Instead of a congruent clause complex 'if they wish to be interviewed or to comment about UCLA's compliance with its obligations, employees contact the OFCCP office', the conditioning clause is 'delayed' in coding and is represented as a relative clause postmodifying the noun its subject refers to -- diagrammatically:

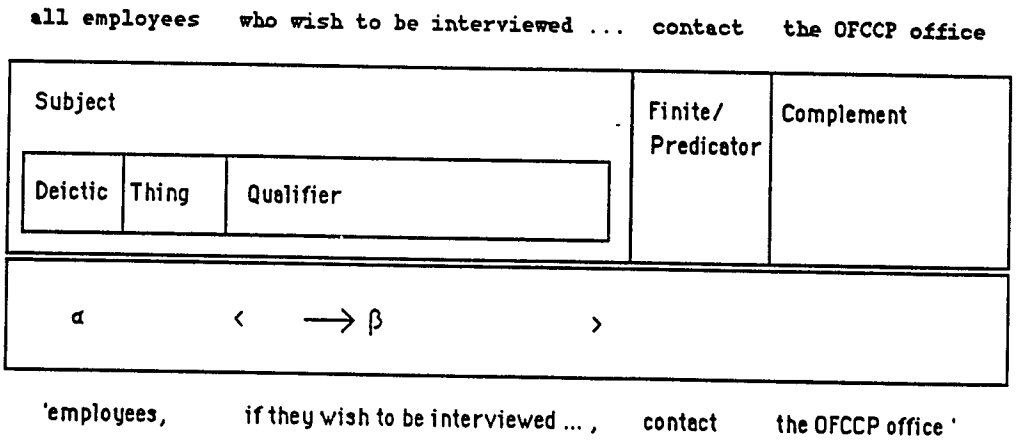


Fig. II:3.3-19: Conditional clause as embedded relative clause

Similarly:

It's new brochure time, and that means a chance for new project write-ups. Anyone ⟦*desiring to update their entry in this brochure*⟧ should have their copy in (to me) by Dec. 1. Otherwise the existing entry will be used. (BBoard message)

3.3.4.3.2 Projection

There are at least two metaphorical possibilities in the case of projecting clause complexes: (i) the projected clause may be downgraded, serving as a constituent of the projecting clause; or (ii) the projecting clause may be downgraded as a nominal group with the projected clause as a postmodifier.

(i) projected clause downgraded

> *Reflecting* on [the self-serving and fractious *behavior* of legislators], ... (Wyatt, 280) 'reflecting that legislators behaved in a self-serving and fractious way, ...'

> Webster *ordered* [the *dismissal* of the CIA's former Costa Rica station chief, Joe Fernandez, and the chief of paramilitary operations in Tegucigalpa, Honduras] after concluding that the two had improperly aided Lt. Col. Oliver L. North's secret program to supply the Contras inside Nicaragua. (LAT, 18/xii/87) 'Webster ordered ... to be dismissed'

> I also *confess to* [some *confusion* about the notion that quarks can live as particles inside a proton but not outside]. (Krisch, 44) 'I also confess that I'm partly confused about the notion that quarks can ...; I also confess that it partly confuses me that quarks can ...'

> The clever and catchy QCD ideas that have been proposed to *explain* [the apparent *confinement* of quarks] may turn out to be correct, ... (Krisch, 44) '... explain that quarks are apparently confined'

In these cases, the projected clause is downgraded as a Range constituent of the projecting clause; but it may also function as Subject in an impersonal projecting clause:

[The *change*] *was rumored* in Prague for several days. (LAT, 18/xii/87) 'it was rumored ... || that x would change'

(ii) projecting clause downgraded with projected clause as postmodifier (cf. Section II:3.2 above). When the projecting clause is downgraded and the process is represented as if it were a thing, there is a new process specifying how the information projected is 'distributed' -- spreading, getting out, getting around, and the like; for instance:

Like wildfire, the *prophecy spread* ⟦that the "end of the world as we know it" was near⟧ (Wyatt, 213)

Then a *rumour spread* ⟦that the Government was going to make advances of seed⟧, and at last one day the Korala Mahatmaya appeared in the village, and the rumour was confirmed. (L. Woolf, p. 77)

On the morning after Babun's return to the village a *rumour spread through the village* ⟦that the headman's house had been broken into during the night, and that Babehami had left at once to complain to the Korala⟧. (L. Woolf, p. 107)

3.3.4.3.3 No congruent alternative

The approach of delayed coding has the advantage that it does not depend on the possibility of a congruent coding. There are a number of reasons why there may not be a congruent alternative. It is important to identify these since they will have to be taken into account in generation. We can think of these reasons as situations where delay is the most convenient option. The congruent alternative may run into problems (i) with one of the clauses as well as (ii) with the conjunctive relation of the clause complex.

(i) No congruent clause

This situation arises when there are nominal resources for expressing a process (by reifying it) but no verbal resources. This may be due to the noun serving as the Head of the nominal group -- *trend, tendency, crisis; election, reign*[5]:

> Field Marshal Sarit Thanarat might be said to have come to power out of a *crisis* of cultural transition. (Wyatt, 278)

These shade into general nouns of actions and events such as *act* and *event:*

> One of the most extraordinary *acts* of his reign was his renovation of Wat Phrachetuphon (Wat Pho) in Bangkok. (Wyatt, 175)

> The ensuing *events* wrought much confusion and destruction (Wyatt, 82)

cf. also, with nouns of impersonal projection (*news, rumour, idea, fact,* etc.):

> The *news* escaped from the sick-room that Camila had become ludicrous in homeliness. (Wilder, 104)

The lack of a congruent variant may also be due to the use of nominal group resources without clausal equivalents:

> After a *wait* [[*that seemed interminable*]] the train began cautiously to advance once more. (Farrell, p. 285)

---

[5] In the case of examples like *election* and *reign,* the nouns may represent institutions of considerably more complexity than the corresponding events of *electing* and *reigning.*

A *particular objection* appears to arise from what scientists call the nonlocal nature of the approach. (Bohm & Peat, p. 98)

(ii) No congruent conjunctive relation

While circumstantial relational processes in simple clauses correspond to enhancing conjunctive relations in clause complexes, it is not always clear that there are similar clause complex correspondences:

First, the opening of the kingdom to the full force of international trade by the Bowring treaty rapidly *encouraged* Siamese economic specialization in the growing of rice ... (Wyatt, 215) ~ First, because the Bowring treaty opened the kingdom ... Siamese economy specialized in the growing of rice

Continued gains in the residential area ... were just about *offset* by a sharp decline in nonresidential building. (FRB)
'balance'

Declines in auto and gasoline sales should *contribute to* a slower expansion of retail activity following the April bounceback. (FRB) 'partial cause'

A sharp downward revision to the advance report on durable goods orders, together with an expected decline in the nondurable area, *produced* a third consecutive month drop in total factory orders; (FRB)

For instance, the temporal component of an example such as the following --

Gains in factory stocks and those at retailers should be partly offset by a decline in new car inventories (FRB)

-- can be represented by means of a clause complex: 'As factory stocks gain ..., new car inventories decline'; but this does not capture the component of

counteraction and (partial) equilibrium.

3.3.4.4 Rankshifting metaphors

Let's now turn from decomplexing metaphors to rankshifting ones. As we will see, we now have to take the clause rather than the clause complex as starting point. I will start by discussing how rankshifting metaphors are related to rankshift in the grammar (Section II:3.3.4.4.1). I will then briefly consider how rankshifting metaphors might be approached (Section II:3.3.4.4.2) and finally I will offer a short survey of rankshifting metaphors (Section II:3.3.4.4.3).

3.3.4.4.1 Rankshifting metaphors and rankshift

The unit realizing a function bundle in the structure of another unit is at the next rank down in the unmarked case. Thus, groups serve in clauses and words serve in groups:

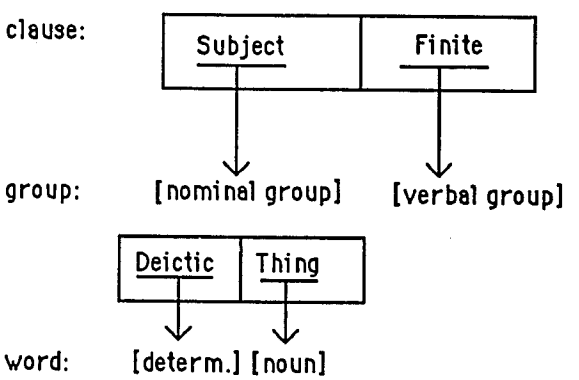


Fig. II:3.3-20: Ranking realizants

Rankshift is the process by which the expected rank of a realizant is shifted to a higher rank. For example, the expected rank of units realizing participants in the clause is group rank, but through rankshift clauses can come to serve instead. Since the rank of the rankshifted realizant is higher than the one expected, the result of rankshift is to downrank units: a clause serves as if it were a group, a group serves as if it were a word, and so on. For example, modifiers in the nominal group are expected to be of word rank, but through rankshift a clause may come to serve as if it were a word, which is reflected in the traditional terminology: the clause serves as an "adjectival" clause.

Rankshifting metaphors are similar to rankshift in general in that they work in terms of the rank scale and downrank units. However, they start high and work down the rank scale. That is, what would be coded congruently at clause rank is coded metaphorically at group/phrase rank. Further, while downranked units only serve as units of a lower rank, rankshifting metaphors are structured as the units of the lower rank; what would be coded congruently as a clause is coded as a nominal group, and so on. The differences are diagrammed below.

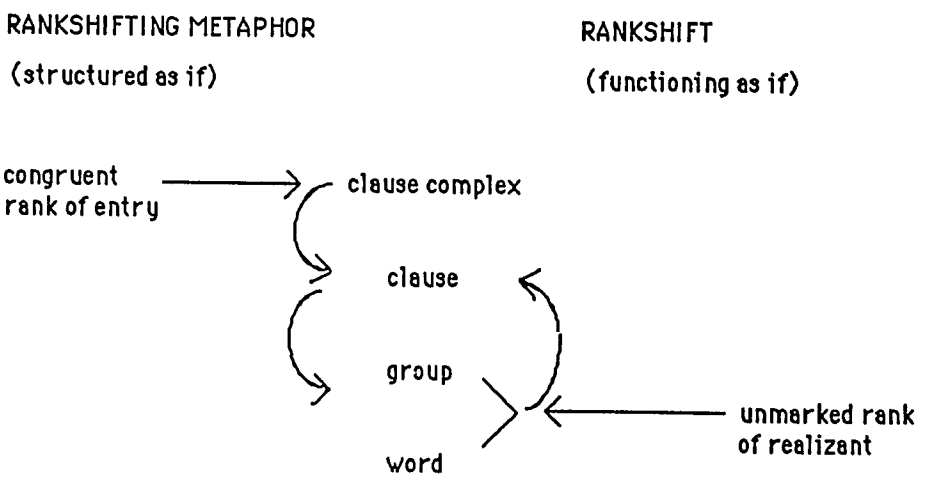


Fig. II:3.3-21: Rankshift and rankshifting metaphor

For instance consider the following example of a mental clause in which the Phenomenon is a rankshifted clause, serving as a group:

> ⟦That relations with Laos deteriorated during this period⟧ worried the Thai military regime.

By means of grammatical metaphor, the (downranked) clause can be represented as a nominal group:

> ... [the deterioration of relations with Laos during this period] worried the Thai military regime. (Wyatt)

The first move is to downrank a clause functionally to serve as a group and the second move is to downrank it structurally so that it is represented as a group:

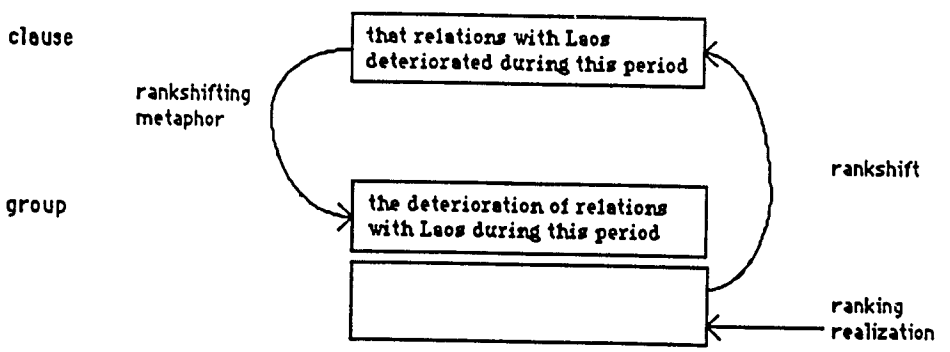


Fig. II:3.3-22: Example of rankshift and rankshifting metaphor

Since an independent clause cannot be downranked to a metaphorical nominal group, clauses serving as the starting point for rankshifting metaphor

must already be rankshifted clauses -- clauses serving as if they were groups. Rankshifting metaphor and rankshift may thus work together. That is, we find cases where the congruent realization is a rankshifted (downranked) clause serving as if it were a group and the metaphorical realization is a representation of this clause as if it were a nominal group.

The downranked clause may name a circumstance, thing, metathing, or macrothing; if it names a metathing (a fact) or a macrothing (an act) it may be realized metaphorically as a nominal group.[6] The distinction between metathing and macrothing is neutralized in the metaphorical version:

downranked clause naming		example clause (congruent)	group (metaphorical)
circumstance		when he admired Yeats why	
thing		what he admired (the one he admired)	(an admirer of Yeats)
reified process	metathing (fact that)	that he admired Yeats	his admiration for Yeats
	macrothing (act of)	him admiring Yeats	

Fig. II:3.3-23: Rankshifted clauses and rankshifting metaphor

[4] The terms metathing and macrothing are Halliday's; they will be used again in Chapter IV in the discussion of the ideation base of a text generator. Nominalizations such as *admirer* are not considered metaphorical: they are like nouns naming relations of kin and social relations -- *mother, friend, boss,* etc. -- and like these they can have a 'complement'-like qualifier: *admirer of; mother of.*

3.3.4.4.2 Approach to rankshifting metaphors

As with complexity-shifting metaphors, the congruent and metaphorical codings constitute different grammatical units: one is a clause and the other is a nominal group. Consequently, we can try to approach rankshifting metaphors without facing the problem of how to integrate the the congruent and metaphorical representations. We can choose to generate the metaphorical representation instead of the congruent one. If we follow this approach, rankshifting metaphors can be dealt with without extending the framework. Since RANK is a system in the system network (Section II:1.2.1.4.2.1), we can build in an additional option of metaphorical rankshift. We can do this in terms of the type of thing the nominal group serves to represent, following the table above: is it an ordinary thing (an object, person, abstraction, institution, collective, etc.) or a process represented as a thing, a reified process. If it is a reified process, the question is whether it is to be represented congruently or not. If it is to be represented congruently, it is represented by means of a clause and a further distinction is made between metathing (fact) and macrothing (act: process configuration). If it is to be represented metaphorically, it is represented by means of a nominal group and the distinction between 'meta' and 'macro' is not made. These options are set out in the system network below.

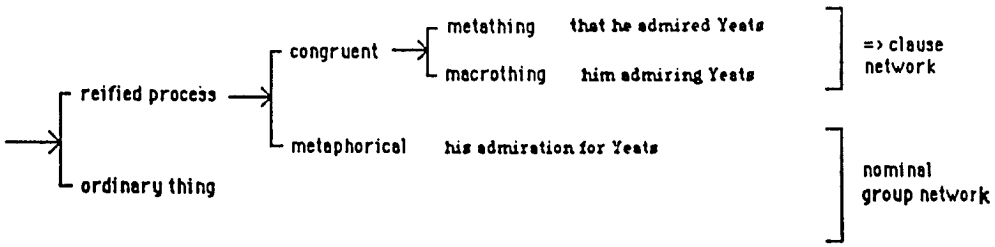


Fig. II:3.3-24: Rankshifting metaphor as system option

I have assumed that the option metaphorical leads to further nominal group systems. These are partly the same as for ordinary nominal groups and partly unique to 'nominalization groups'. The systems specific to the nominalization group deal with the transitivity of a metaphorically represented process. For example, the four process types are distinguished, since they lead to different grammatical possibilities:

material: `their donation to the temple of a large sum of money`
mental: `their belief [[that the earth is flat]]`
verbal: `his reply to me [[that they would look into the matter]]`
relational: `his possession of coke`
`the strength of the structure`

One might also explore the possibility of using the transitivity network of the clause instead of setting up a separate one for the 'nominalization group'. This is certainly theoretically feasible in a single network grammar (cf. the note on sharing in the introduction to Section II:1.2.1.4.2 above). However, descriptively it may not be very productive. On the one hand, there are a number of

(congruent) transitivity types without metaphorical versions; e.g., identifying clauses such as *Olivier is Lear* belong here (unless we want to regard *the identity of Olivier with Lear* as the metaphorical version). On the other hand, abstract nouns that relate to but cannot be derived from the process types also enter into the picture -- *fact, case, law, principle; evidence,* and so on -- as do nominalized modalities -- *possibility, certainty, chance,* etc..

To see in more detail what the scope of rankshifting metaphor is, let's now survey the various subtypes.

3.3.4.4.3 Survey of rankshifting metaphors

(A) Correspondences between clause and nominal group

Since the nominal group is the metaphorical equivalent of the clause, processes, qualities, and modalities are reified. The main possibilities in the metaphorical representation of a clause are set out in the diagram below.

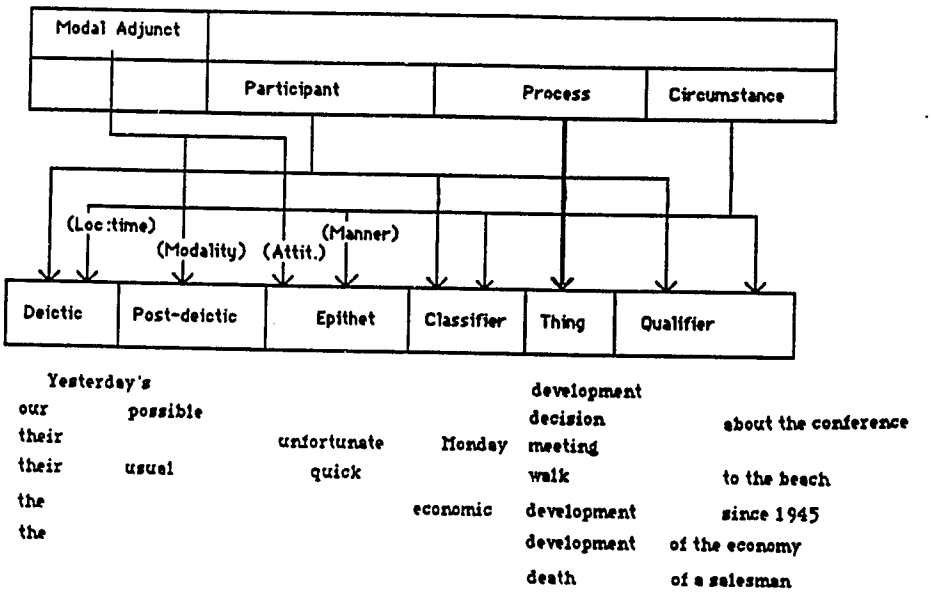


Fig. II:3.3-25: Congruent clause, metaphorical nominal group

One correspondence is held constant: Process is represented as Thing in the nominal group (symbolized by the heavy vertical line). Participants can be represented either as Deictic or as Qualifier; or, if they are not determined, as Classifier. Circumstances can similarly be represented by Deictic, Qualifier, or Classifier, but Deictic is largely restricted to circumstances of temporal location; and circumstances of manner are typically represented by Epithet.

Modal Adjuncts are represented by Postdeictic if they express a modality and by an attitudinal Epithet if they express attitude; e.g.:

the (Postdeictic:) *apparent* confinement of quarks (Krisch)

The Postdeictic may also specify a conjunctive relation; e.g.:

the (Postdeictic:) *subsequent* capture of Kampar fortress (Farrell)

If the congruent clause is an ascriptive & intensive relational one, the Process is not normally represented in the metaphorical nominal group; instead, the Attribute is the Thing:

[The child's strength] surprised him

(B) Grammatical contexts

Let's now turn to the context in which the rankshifting metaphor occurs. The clause in which the rankshifting metaphor serves may itself be a metaphorical representation of a clause complex -- a 'decomplexed' complex, in which case the rankshifting metaphor is just the next step in the metaphorical process started by the representation of the clause complex as a clause. For instance, it may be a circumstantial relational clause, such as

Our late dinner <u>was followed</u> by a swim in the moonlit pool

-- 'we dined late and then swam in the moonlit pool'. However, many cases do not correspond to congruent clause complexes; rather, they correspond to

rankshifted clauses. I will examine these briefly and give further examples to indicate the range of the grammatical contexts in which they occur. As was noted above, while rankshifted clauses can represent either an 'act' or a 'fact', nominalizations neutralize this distinction; the choice of the appropriate congruent alternative depends on the context.

(1) Clause: participant

(i) material

When the metaphor is a participant in a material clause, it represents an act rather than a fact. Consequently, the alternative representation is a non-finite clause but not a finite *that*-clause.

effective; as Agent

[By elections held in March] gave the Democrat party thirteen new seats to the government's nine ... (Wyatt, 280) 'electing [candidates] in March gave Democrats ...'

[His cold level gaze] threw her back on herself. (Christie, 35) 'him gazing in a cold and level way'

[Gordon's death] has left Jeremy in no end of a hole, (Christie, 58) 'Gordon dying' [but also clause complex: 'because Gordon died, Jeremy is in no end of a hole]

causative behavioural

[David's laugh] made her flush. (Christie, 39)
[but also clause complex: 'because David laughed she flushed']

(ii) mental: reactive

The metaphor can serve as the Phenomenon of a reactive mental clause. Here it may be interpreted as a 'fact' as well as an act and so is in alternation with a finite *that*-clause as well as a non-finite clause.

> Taken together, [the deterioration of relations with Laos and Cambodia during this period] worried the Thai military regime. (Wyatt, 284) 'that relations deteriorated'
>
> [The interruption] startled her. (Christie, 58) 'that he interrupted' (fact) or 'him interrupting' (act)
>
> [Her interest] surprised him. (Christie, 67) 'that she was interested' (or: 'what she was interested in')
>
> [His denial], it seemed, she put aside as negligible. (Christie, 26) 'she ignored the fact that he denied'
>
> He had fancied that Rowley Cloade was annoyed by [the announcement of his stay in Warmsley Vale]. (Christie, 162)

(Cognitive mental clauses and verbal clauses involving grammatical metaphor tend to correspond to congruent projecting clause complexes.[7] They were discussed and exemplified above.)

(iii) relational

(a) ascriptive

> Nevertheless, [the effort entailed] will be worthwhile. (Scientific American) 'trying it will be worthwhile'

[7] However, we find examples such as:
After all, [Underhay's death] was accepted in Africa. (Christie, 177)

(We can take this one step further, to an elaborating clause complex: '[we] will try [it], which will be worthwhile'.)

(b) identifying: indicating

Identifying clauses of indication (for the notion of indication, see Halliday, 1985: 154) may contain one or two downranked metaphorical nominal groups:[8]

> [The *crash*] also <u>reveals</u> [the greed-driven *stupidity* of Reagan's economic policies]. (Mother Jones) 'that the market crashed reveals that Reagan's economic policies were stupid because they were driven by greed'

> [The combination of strong *shipments* and sluggish *orders*] <u>suggests</u> that the surprisingly brisk pace is coming out of backlogs of unfilled orders. (FRB)

> Additionally, [the factory inventory *report*] <u>showed</u> [a surprising *pickup* in the rate of stockbuilding] (FRB)

> [Strong auto *demand* and a *bounceback* in department store sales] <u>points to</u> [a partial *reversal* of the sharp decline in March]. (FRB)

(Enhancing equative clauses involving grammatical metaphor tend to correspond to congruent clause complexes. They were discussed and illustrated above.)

---

[8] If we posited a further step of a congruent clause complex in the interpretation of these metaphors, we would have to 'unpack' the indication as a metaphenomenal process of perception. For instance, taking the first example below: (metaphorical:) *The crash also reveals the greed-driven stupidity of Reagan's economic policies;* (congruent:) *[the market] crashed, so we see that Reagan's economic policies are stupid because they are driven by greed.* (The last clause has not been completely reworded; it is still metaphorical.)

(2) Nominal group: Qualifier

The metaphor may also correspond to a rankshifted clause serving as Qualifier in a nominal group; for instance:

> In the second year [of *expansion* in the mid-'Seventies], the leaders were running at 5% to 7% dip over year-earlier levels. (FRB) (This example may be taken one step further in the interpretation, to a clause complex: 'when the economy expanded in the mid-'Seventies for the second year, the leaders were running ...'.)

> The act [of *measurement*] therefore has an important effect on what is measured and its full implication in fact led to a radically new use of language in science and to a split between the power of mathematics, and of the informal language of science, to describe reality. (Bohm & Peat, 77) 'The act of measuring'; taken one step further: 'Measuring'

3.3.5. Ranking metaphors

Having looked at complexity- and rank-shifting metaphors, I will now turn to the second major type of ideational metaphors identified above in Section II:3.3.3.3: ranking metaphors.

3.3.5.1 The notion of ranking metaphor

Examples such as *The ensuing events wrought much confusion and destruction* point to the clause as starting point rather than the clause complex. The Agent is a nominal group which names a series of happenings without

representing them as processes with the potential for participation by participants; it might be a person: *Henry wrought much confusion and destruction.* Further, the Process, *wrought,* is not one of simple relational cause that corresponds directly to a conjunctive relation. Rather, it embodies the category meaning of 'effective', as in *Henry destroyed many buildings.*

If the example is interpreted as starting with a congruent clause rather than a clause complex, the congruent form would be something like 'the ensuing events confused and destroyed a great deal'. In the metaphorical version, the Agent remains the same, but the Process becomes the Medium of a general process of effecting the confusion and destruction:

the ensuing events *confused and destroyed* *a great deal*

Agent		Process	Degree
	Process	Medium	

the ensuing events *wrought* *much confusion and destruction*

Fig. II:3.3-26: Metaphor within clause

The metaphor involves a different kind of clause structure. The starting point, which is the clause, is not downranked. Consequently, it is not possible to treat this metaphor simply as a delay of coding (Section 3.3.4.2) or a rank-related option (Section 3.3.4.4.2). Rather, it is a reconfiguration within the relevant unit. For example, in the clause, the process or part of the process may be

reinterpreted as a participant or a circumstance may be reinterpreted as a participant.[9]

I will present a brief overview of the major subtypes of ranking metaphor. The approaches to solutions vary with the different types, but the general strategy is to handle the metaphorical options semantically by setting up the semantics so that it can anticipate the metaphorical option as well as the congruent one. This will typically mean a delay in the realization of a particular semantic category until it has been established whether it is to be expressed congruently or metaphorically. This type of approach is discussed in Section III:4.

3.3.5.2 Clause complex

A paratactic extending clause complex of the type 'p [do!] and q' and 'p [don't!] or q' can be interpreted as representing a hypotactic conditional enhancing clause complex: 'if p, then q'; for instance:

> "Give your evidence," said the King; "and don't be nervous, or I'll have you executed on the spot." (Carroll)
> 'and if you're nervous, I'll have you executed on the spot'

This type of metaphor involves a reclassification from enhancing to extending and a restructuring from hypotactic to paratactic. (It also involves an interpersonal metaphor of mood: a condition is represented as a command.)

[9] I have already noted the analogy between metaphorical layering and metafunctional layering. In the example above, the experiential metafunction splits into two perspectives -- a process perspective and a reifying one.

3.3.5.3 Clause

It is convenient to distinguish two types of ranking metaphors involving clauses:

(i) metaphors that provide alternative ways of configuring the clause and, as a result, alternative classifications of the 'reconfigured' parts (Section II:3.3.5.3.1); and

(ii) metaphors that provide an alternative classification with the same kind of configuration (Section II:3.3.5.3.2).

(i) For instance, the complex Process *begin to analyse* can be re-configured metaphorically as Process (*begin*) + Medium (*the analysis*), so that alongside the congruent clause

We began to analyse at 4

we have the metaphorical version

We began the analysis at 4

Since part of the process has been re-interpreted as a participant in the metaphorical version, it can now serve as Theme and / or Subject:

The analysis we began at 4
The analysis was begun at 4

(ii) The second type preserves the overall constituency configuration but provides an alternative classification; for instance, an intensive ascriptive clause may be 're-classified' as a possessive ascriptive clause:

(congruent:) `The kingdom remains independent`

(metaphorical:) `The kingdom retains independence`

3.3.5.3.1 Metaphors providing alternative configurations

Ranking ideational metaphors of the clause provide alternative configurations of the elements of transitivity, i.e. of process, participants, and circumstance. There seem to be two major types.[10]

(i) Circumstance as participant: A circumstance (temporal location) is represented as if it were a participant (medium), by means of a clause of perception and the rest of the transitivity structure is represented as a participant (range).

(ii) [Part of] Process (+ participant) as participant: [Part of] the process, possibly together with one or more participants, is represented as a participant.

[10] The Process of the clause does not, in principle, serve to represent participants or circumstances metaphorically (cf. remarks in Hopper & Thompson, 1983, on the existence of nominalization metaphors but absence of verbalization metaphors). Exceptions might include examples such as *it doesn't matter* (Process) for *it is not* (Process) *important* (Attribute) and *precede* (Process) for *be* (Process) + *before* (part of circumstantial Attribute).

3.3.5.3.1.1 Circumstance as participant

The first type is illustrated by the following pair.

(congruent:) We crossed the border at noon

(metaphorical:) Noon saw us crossing the border

A circumstance can be represented as a participant on the model of a middle mental clause. More specifically, a temporal location is represented as the senser of a mental process of perception. The process and participants of the congruent clause are represented as the phenomenon of perception. For instance:

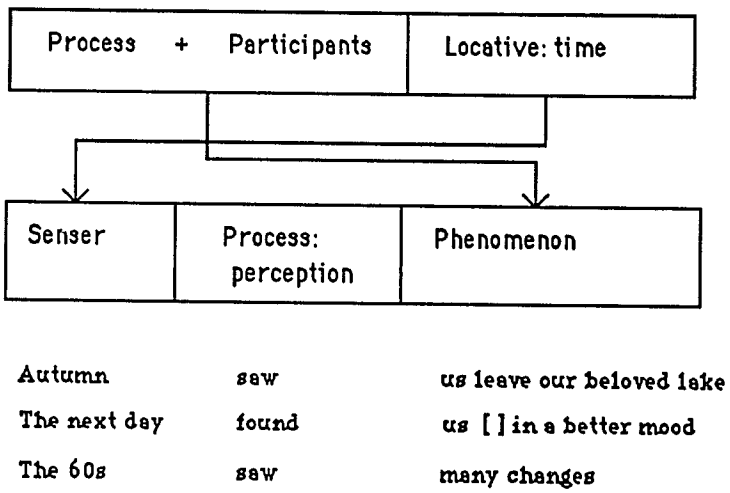


Fig. II:3.3-27: Circumstance represented as participant

Since these ideational metaphors involve *reconfigurations* of the congruent representation of a configuration, the unmarked mappings to textual functions

may change. In particular, the unmarked ***thematic organization*** of the clause is different. The unmarked mapping is Senser / Subject / Theme in a declarative clause, which means that circumstance-as-senser becomes the unmarked theme. Consider the following excerpt from a guide book. The fragment is organized temporally according to the seasons of the year, which makes the seasons natural theme candidates.

[Exploring the Blue Mountains]

> Spring and fall are the most beautiful time of year here. In springtime, millions of wildflowers and trees bud, and the many planned gardens in the region start to flourish. In fall, the North American species of trees introduced long ago to the region -- oak, elm, chestnut, beech, and birch -- do the same in the Blue Mountains as they would in the Catskills: turn brilliant reds, oranges and yellows. *Summer finds* campers and hikers descending on the mountains in throngs, and winter is the time the mountains are at their quietest and most peaceful, offering perfect solitude for city escapees. (Fodor's Sydney, p. 115)

Since the temporal location can be given thematic status in the congruent version as well as in the metaphorical one, the thematic consequences of the reconfiguration do not explain why the metaphorical strategy is chosen over the congruent one, but do indicate the kind of role the metaphor plays. We may note, however, that there is a concomitant feature of the metaphor, of potential textual consequence: the metaphor creates a new constituent, the Phenomenon of the perceptive clause. This constituent groups Process + participants and typically towards the end of the clause, the position of the unmarked focus of information. For instance, the congruent clause

In summer, campers and hikers descend on the mountains **in throngs.**

may have the same Theme as the metaphorical one ('summer'), but the Culminative (in boldface) is a different one: only *in throngs* comes as the last constituent of the clause. The metaphorical clause groups *campers and hikers descending on the mountains in throngs* as the Phenomenon, which provides the culmination of the clause:

Summer finds **campers and hikers descending on the mountains in throngs**

The important general point is that while the alternation between congruent and metaphorical is an ideational one, it is put to textual service. In this respect, it is like the reconfigurations of theme predication ('cleft') and theme equation ('pseudo-cleft').

Further examples are given below; all of them have the Senser as the Theme and several of them involve structural themes in relative clauses. (Theme / Subject / Senser is underlined; Phenomenon in boldface.)

1987 saw **the successful publication of the first two volumes of the "Occasional Papers in Systemic Linguistics"**, and the editors are now looking forward to the next two volumes, which they intend to put out before the end of 1988. (Circular letter)

Not exactly the most inspiring year in Hollywood history, was it? *Nineteen eighty-seven saw* **the large producers and distributors playing it safer than ever before**, coming up with device after device to guarantee profits. This was the year in which pre-marketing and audience testing reached its most insanely counter-productive level ever. (LA Reader)

This is the same Thailand, however, *that* within the past decade *has seen* **vicious political violence on the streets of Bangkok and ceaseless labor unrest with strikes previously unknown,** involving not only a growing population of factory and other blue-collar workers but also thousands of farmers agitating for land reform and against bureaucratic insensitivity. (Wyatt, p. 277)

Parkinson, 56, was named energy secretary in a post-election Cabinet change *that saw* **four of the Cabinet's 21 members leave and seven others change portfolios.** (LAT, 14/vi/87)

At the end of a day *that has seen* **his restaurant destroyed,** Frank sits down at his kitchen table and says to himself "Please somebody help us." (LAT, 18/xii/87)

Now at length the Marquesa had something to be anxious about: her daughter was to become a mother. *This event* which merely bored Doña Clara *discovered* **a whole new scale of emotions** in the Marquesa. She became a mine of medical knowledge and suggestions. (Wilder, p. 36)

Here is an example where the Senser is the Subject and would thus be the default Theme but is preceded by a locative Theme:

This is the same Thailand, however, that within the past decade has seen vicious political violence on the streets of Bangkok and ceaseless labor unrest with strikes previously unknown, involving not only a growing population of factory and other blue-collar workers but also thousands of farmers agitating for land reform and against bureaucratic insensitivity. In a country never distinguished for ideological passion, where a "mai pen rai" ("Never mind!") attitude toward public life seemed pervasive, *the seventies saw* **a massive outpouring of political sentiment on both the right and the left.** The Communist party of Thailand suddenly appealed to large numbers of young Thai, ... (Wyatt, p. 277)

There is a similar type with relational clauses of possession. The specification of time is represented as the 'Possessor':

He returned to Bangkok for a bit of schooling, then at age eleven opted for a military career and entered the army officers' academy, from which he was graduated in 1928. *His early army career seems to have been distinguished by able service in a variety of postings, all in Bangkok until 1938.* (Wyatt, 279)

But it's one of the small attempts being made here to turn back tomorrow, *which* most experts say *holds* more ecological *decay,* more frequent droughts and even more severe famines. (LAT, 18/xii/87)

Grammatical metaphors of the type just illustrated are difficult to represent within the clause simply as another (textual) option for organizing it: the metaphor embodies a fairly wholesale reorganization of the congruent clause -- in this respect, it is like theme predication and theme identification. The most straightforward approach is to give the semantics the capability of anticipating the grammatical alternatives, thus locating the alternation at the semantic level.

3.3.5.3.1.2 (Part of) process (+ participants) as participant

Consider the following example:

We (α:) began (β:) to analyse with a technique known as DNA hybridization.

The process of analyzing is phased and is represented congruently by means of a hypotactic verbal group complex ((å:) *began* (∫:) *to analyse*). There is an alternative, metaphorical strategy. It splits the process into two parts, the phase ('begin') and the event itself ('analyse'), which are represented as Process + Medium. The event part of the phased congruent process is thus represented as

a participant:

We began our analysis with a technique known as DNA hybridization. (Sc. Am. xi/87)

The two alternatives are diagrammed together below. The metaphorical reinterpretation is fairly local in the clause, involving only the alternation Process ~ Process + Medium and leaving Agent and Manner unaffected.

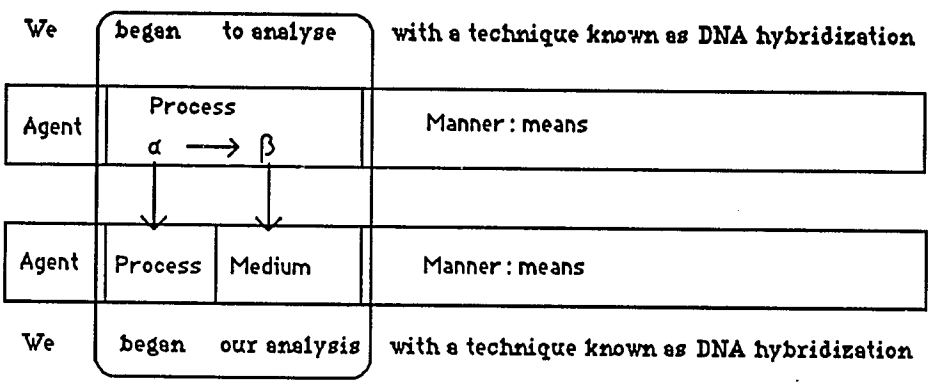


Fig. II:3.3-28: Part of process as participant

In this example, the congruent process is complex and the process in the metaphorical version is the first element of the complex (phase, in the example above). If the congruent process is simple, the process of the metaphorical representation is realized by a general meaning 'happen' or 'perform': *occur, take place, come, do, take, give, have*, etc.. For example:

(congruent:) We analysed with a technique known as DNA hybridization.
(metaphorical:) We did our analysis with a technique known as DNA hybridization.

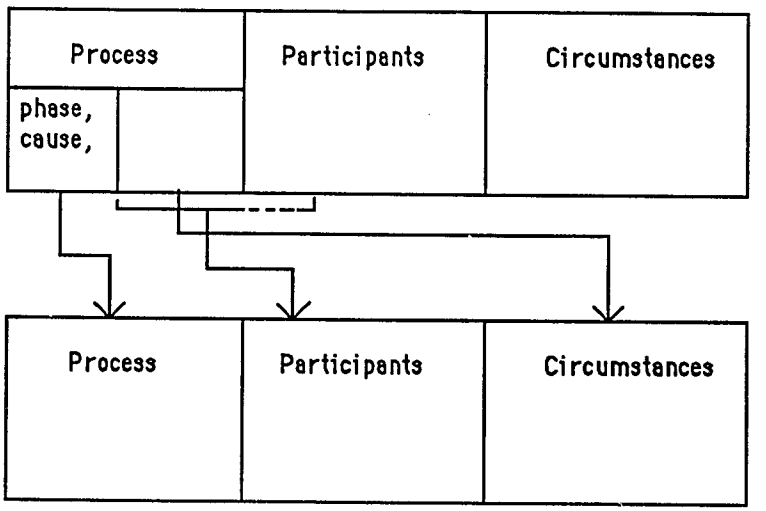
The participant of the metaphorical version corresponding to (part of) the congruent process may also span one or more participants, as in

(congruent:) We [began to analyse] [the data] with a technique known as DNA hybridization.

(metaphorical:) We began [our analysis of the data] with a technique known as DNA hybridization.

Here the metaphorical Medium (*our analysis of the data*) corresponds to (part of) Process + Medium in the congruent version.

The Process may also correspond to a circumstance in the metaphorical version (see further Section II:3.3.5.3.1.3 below). The possibilities are summarized diagrammatically below.



bring	it	to a halt
come		to a halt
occur	changes	
begin	operation	
attempt	improvements	
take	a shower	
have	regrets	
be	afraid	

Fig. II:3.3-29: Process as participant / circumstance

The participants representing the process metaphorically are either Medium or Range. The circumstance is one of directed location, destination; in the metaphorical version it occurs in the process is one involving change in location. Examples are tabulated below.

		Medium	Range	Circumstance
simple		Changes occurred	He did translations He gave a talk	
complex	phase	Changes continued He began the translation		He fell into gambling
	causation	He caused changes		He put it into operation
	conation	He tried translation	He made an attempt at translating	
	projection	-	He has plans to write	

In what follows, I will illustrate the range of possibilities for representing the process as a participant and as a circumstance:

(1) [Part of] Process as Medium

(2) [Part of] Process as Range

(3) [Part of] Process as circumstance

(1) [Part of] Process as Medium

(i) simple process

When the process in the congruent representation is simple, the process of the metaphorical version merely indicates the category of meaning of middle or

effective: (a) 'happen': occurrence (*occur, take place, come*) or (b), which focuses on the relationship between the process and a circumstance. (It is perhaps related to type (a) as existence is related to ascription: ascriptive being embodies a specification of the scope of existential being.)

(a) occurrence

From an ideational point of view, as some of the examples below illustrate, this type of metaphor can serve to represent a process impersonally. From a textual point of view, it is interesting to note that the reified process is thematic in all the examples and that there are often specifications of 'temporal manner' (*rapidly, faster*) and temporal locations in the rhematic part of the clause.

> *Changes* indeed *were occurring* rapidly (Wyatt, 214)
>
> *Similarly ominous developments occurred* during the Second Reign to the north of Cambodia in the principality of Champassak. (Wyatt, 163)
>
> *violent proton-proton collisions occurred* mostly when the beam and the target were polarized in the same direction. (Krisch, 42)
>
> But *these changes in the weather,* he notes, *have taken place* only since 1972, and they are apparent only in contrast with the weather of an equally brief period: the fifties and sixties. (The Atlantic)
>
> Psychological experiments have established that visual perception is clearly conditioned by the circumstances *in which that perception takes place,* for example, the "meaning" and which questions are put to the viewer at the time. (Bohm & Peat, 69)
>
> However, Bohr himself had emphasized that there is no meaning in talking about the existence of the electron except as an aspect of the unanalyzable pattern of phenomena *in which its observation takes place.* (Bohm & Peat, 81)

The culmination of the struggles of the thirties *came* in 1937-38 when tempers heated up over a number of issues (Wyatt, 251)

Her breath *came* faster. (Christie, 56)

A half choked exclamation *came* from Rosaleen. (Christie, 117)

The Process of the metaphorical version may include a circumstantial feature, as in the following examples.[11]

Frances's sudden smile *flashed out*. (Christie, 32) 'occur + manner: quick'

(He frowned as he looked at her and let his *thoughts* race ahead. (Christie, 60))

A buzz of excitement *went around* the Court. (Christie, 147) 'occur + location: circular'

Despite a sharp drop in purchases of foreign energy supplies, import *growth* edged up -- largely reflecting gains in manufactured products and chemicals. (FRB) 'occur + manner (degree): more & more', i.e. 'imports grew more & more'

Cf. also, still further away from a congruent alternative (Manner: quality):

Her *smile* *hardened*. (Christie, 32)

Existential:

Alongside

Many other changes have occurred

we may have a clearly existential version:

There have been many other changes

there should be a notable *pickup* in the PPI relative to

[11] It is thus similar to the metaphors corresponding to complex processes discussed below, but the circumstantial feature is expressed as a circumstance rather than by a verb forming part of a complex process in the examples cited here.

trends over the past six months (FRB)

There was a fractional *pause* and then David said: ... (Christie, 117)

Let me give one last example with some of its context to bring out the textual use of the metaphor.

"Blackmail!" he muttered. "Blackmail! My God, am I the kind of man to let myself be blackmailed?"
She shook her head, bewildered, troubled.
"If I knew," David was saying. "If I only knew!"
From Rosaleen there came **a small miserable sob.**
He went on:
"It's this working in the dark - working blindfold -"
He wheeled round suddenly. (Christie, 81)

Here Rosaleen is thematic and her behaviour is 'news'; Rosaleen figures in the immediately preceding discourse, but she is not picked up in the immediately subsequent discourse. This example contrasts with one given earlier, repeated here with some of its context --

"It's rather more serious than that," said the Superintendent. "A man died at the Stag Inn last night. Perhaps you saw it in the papers?"
David shook his head.
"No, I didn't notice it. What about him?"
"He didn't only die. He was killed. His head was stove in as a matter of fact."
A half choked exclamation came **from Rosaleen.** David said quickly:
"Please, Superintendent, don't enlarge on any details. *My sister* is delicate. *She* can't help it, but if you mention blood and horrors *she*'ll probably faint." (Christie, 116-7)

Here Rosaleen's behaviour is thematic. She does not figure in the immediately preceding discourse, but is reintroduced as 'news' and is now part of the scene and becomes the topic of David's discourse. The contrast between

the two example illustrates the textual possibilities created by the grammatical metaphor. The congruent clauses -- *Rosaleen sobbed* and *Rosaleen exclaimed* -- do not provide these options. More generally, the contrast illustrates the symbiotic relationship between the textual and ideational metafunctions. The textual metafunction is an enabling, second-order one; but at the same time, the ideational metafunction may create metaphors to serve the purposes of textual organization.

(b) relational: intensive & ascriptive

If a congruent clause has a circumstance of manner, it can be represented metaphorically as a relational clause with the process (+ participants) as Medium/Attribuend and the manner as Range/Attribute:

(congruent:) `Particles collided violently`

(metaphorical:) `The particle collisions were violent`

For instance:

> Moreover, with relatively modest wage gains, personal income *growth* should <u>be</u> *restrained*. (FRB)
>
> The *bounceback* in exports <u>was</u> somewhat *smaller* than expected, considering the sharp drop in February. (FRB)
>
> From here on, the *development* <u>was</u> more *like that* of a scientific metaphor than a poetic metaphor (Bohm & Peat, p. 37)

causative:

To probe as deeply as possible into the interior of the proton we *made* the *collisions* as violent as we could. (Krisch, 44)

(ii) complex process (phase, causation)

When the congruent process is a complex one, realized by a hypotactic verbal group complex å fl ∫, the first element corresponds to the process of the metaphorical version and the second element, possibly joined by participants, corresponds to the Medium of the metaphorical version.

elaboration: phase

Direct Thai involvement in the conflict also *began* early, ... (Wyatt, 288)

The investigation began in 1973 at the Zero Gradient Synchroton (ZGS) at the Argonne National Laboratory. (Krisch, 42)

The standoff continued for nearly a year, until a new series of charges much closer to home provoked an outbreak of popular protest this past summer. (Mother Jones)

Cf. also:

She felt *excitement rising* in her. (Christie, 56)

[He returned her glance squarely, his face unemotional. (Christie, 34)]

In 1973 my research group *inaugurated a different approach at the Zero Gradient Synchrotron:* (Krisch, 43)

The sources said he *shelved plans* to visit Washington last February ... (LAT, 18/xii/87) 'postponed planning to visit'

the talks were *suspended* (LAT)

In 1851, a large majority of them lived within the bounds of the Siamese empire and had *begun the refashioning of their links with their distant cousins,* ... (Wyatt, 181)

As Rowley stared he *repeated his question.* (Christie, 69) 'repeat + ask'

As *the search resumed* under overcast skies at dawn today, the prospect was for grim evidence at best (LAT) 'people began to search again'

enhancement: accompaniment

At this critical moment, Sarit tried to *provide* his countrymen both a *sense* of where they were coming from ... and a clear *vision* of where they were going. (Wyatt, 278) 'help sense & see'

enhancement: cause

Although we are not sure exactly what is *causing* this strange and unexpected *behavior,* it does not appear to be good news from QCD. (Krisch, 45) 'cause to behave'

The standoff continued for nearly a year, until a new series of charges much closer to home *provoked* an *outbreak* of popular protest this past summer. (Mother Jones) 'provoked popular protest to break out, i.e. provoked people to start protesting'

Authorities are also *allowing* the *emigration* of his son (LAT) 'allowing his son to emigrate'

(2) [Part of] Process as Range

(i) simple process

When the congruent Process is simple, all of it is represented metaphorically as Range and the metaphorical version has a Process realized by a very general verb such as *do, make, take, have, give,* and *be.* The combination of the realization of Process + Range is typically ***collocationally conditioned***; this phenomenon will be discussed in its lexical context in Section II:4 below. Metaphors of this kind have, as Halliday (1985) puts it, been domesticated; they often constitute the unmarked choice, whereas the congruent alternative is marked. For instance, 'Process:*err*' is now marked and 'Process: *make* + Range: *mistake*' is unmarked.

In most cases, we can see the representation of the congruent process by means of a range as a straightforward expansion of the function process; there is no additional reconfiguration of constituents. However, in some cases, there is a concomitant alternation in the process type. I will exemplify these cases separately. Whether there is a concomitant reclassification is determined by the process type of the congruent version.

(a) Expansion by ranging within same process type

Expansion by ranging within the same process type occurs in material (including behavioural), verbal, and perceptive mental clauses.

[a:1] material

Field Marshal Sarit Thanarat, long-time associate and rival of Phibun and leader of the 1957 coup, was born in Bangkok on June 16, 1908, the son of an army major who among other things *did Cambodian translations.* 279)

It is usually more practical to wish to *do harm.* (Christie, 40)

Then I went to Canada and *did a job of training* fellows here. (Christie, 44)

She had been steeling herself for several days to *make an appeal* to Rosaleen but true to her nature had procrastinated. (Christie, 49)

Frances *paid no attention* to her. (Christie, 59)

She *took a step* toward the window and paused, facing David. (Christie, 59)

She *drew* her *breath in* sharply. (Christie, 57)

Dr. Cloade *took* one *look,* knelt down and bent over the recumbent figure. (Christie, 104)

The doctor suddenly *flashed* a quick intelligent *look.* (Christie, 164)

Luckily, when he *took a fall,* she happened to come by and find him. (LAT)

In the examples given so far, the nominal groups realizing the Range do not have any modifiers that could not easily be expressed as participants or circumstances. However, the following examples illustrate the pay-off in the potential for modification that the metaphorical strategy provides.

At sufficiently high energies it should *make little difference* whether the two colliding protons are spinning in the same direction or in opposite directions. The fact that the spin directions do *make a big difference* suggests that our understanding of how protons interact with one another is incomplete. (Krisch, 42)

we *made the first measurements* of elastic collisions between protons spinning in known directions. (Krisch, 43)

On the other hand, the quark theory of particle scattering - quantum chromodynamics (QCD) - has *made few predictions* that could be verified. (Krisch, 44)

He spent the war years in the Shan states, there *making the important associations with Phao Sinaynon and Phin Chunhawan that were to provide for this entry into politics in 1947*, ... (Wyatt, 279)

We also find examples where the Range corresponds to the cognate object of traditional grammar:

She *smiled* - rather a twisted *smile*. (Christie, 98)

He *sighed* - a deep unhappy *sigh*. (Christie, 26)

She *sighed* - a deep unhappy *sigh*. (Christie, 185)

In these examples, Christie has used the modification potential of the Range nominal group giving the metaphorical representation of the processes of smiling, sighing, etc. and this possibility is, of course, often the reason for using the metaphorical strategy, just as when the Process is realized by a highly general verb.

[a:2] behavioural, verbal:

I was *having thoughts* about the state of the world. (Christie, 40)

You and I, Lynn, must *have* a long *talk*. (Christie, 42)

Could you *have* a final *think* about the title? (personal letter)

(Alternatively, these examples might be interpreted as relational metaphors; cf. below.)

Process: 'give' + Range

This type is very similar to 'take' (etc.) + Range (for instance, what is given is typically nonspecific) and it seems quite reasonable to interpret the metaphorical process as Range. The only potential problem that there may be a Recipient of the giving, corresponding to the 'target' of the behaviour, and Recipients normally occur in clauses that are benefactive and effective rather than middle and ranged:

Across the breakfast table, David Hunter *gave* Rosaleen a quick surprised *glance*. (Christie, 46) 'glanced at Rosaleen'

She *gave* him a little *nod* of the head and stretched out her hand. He *gave* it a little *squeeze*. (Christie, 121)

However, in most cases there is no Recipient. The process being represented metaphorically is probably always a behavioural one (*sigh, glance, smile, cry*) or a verbal behavioural one (*speak, talk*):[12]

12 These examples are thus not benefactive; there is no recipient. They are different from processes of directed action -- pushing, shoving, punching, kicking, socking, and so on -- represented metaphorically as benefactive processes of transfer with the goal of the directed action as recipient; for example: ... that *Japanese bombers had given Penang and*

She *gave* a quick impatient *sigh*. (Christie, 27)
She *gave* a nervous little half *laugh*. (Christie, 35)
David Hunter *gave* a faint sneering *laugh*. (Christie, 38)
Dr. Lionel Cloade was *giving* his irritable nervous *laugh* as he talked to Frances Cloade. (Christie, 39)
He *gave* a swift appreciative *glance* round the room where they were breakfasting. (Christie, 46)
He *gave* a contemptuous *laugh*. (Christie, 55)
He *gave* a short *nod*. (Christie, 70)
Lily said, "Oh yes, Miss Lippincott," *gave* a *giggle* and added, sighing gustily: ... (Christie, 75)
Behind him, Rosaleen *gave* a little frightened *gasp*. (Christie, 118)
she *gave* no *start*, no *sign* of emotion or recognition (Christie, 122)
then he *gave* a sudden *start* (Christie, 132)
He *gave* a *chuckle* (Christie, 133)
Then she *gave* a quick doubtful *glance* at Poirot. (Christie, 179)
Lynn *gave* a crooked rather pathetic *smile*. (Christie, 200)
Mrs. Cloade came to the door and *gave* her usual *gasp* at seeing Poirot. (Christie, 212)

[a:3] mental: perceptive

and Mrs. Marchmont had *caught sight* of David Hunter walking along the footpath (Christie, 50)
Going on down the Hight St., she *caught a glimpse* of her Uncle Jeremy letting himself into his front door. (Christie, 93)
I was meeting some stuff at the station and *caught sight of* him in the distance. (Christie, 136)
Then one of the gardeners was there working late - shutting up greenhouses or something and he *caught sight of* him. (Christie, 174)

Butterworth a pounding on the previous day. (Farrell, The Singapore Grip, 295); But even in terms of the Second Law the tribulations of the 11th Division were to be wondered at, for they had spent two whole days (while Brooke-Popham inspected his thoughts) waiting at the Siamese border under a tropical downpour for the order to spring forward and *give the Japs a sock on the jaw* as they were trying to land at Singora. (op cit., 297)

(b) Expansion by ranging & concomitant alternation in process type: metaphorical relational clauses

Expansion by ranging and concomitant alternation in process type occurs with reactive and cognitive mental clauses and with material clauses; the metaphorical version is relational.

[b:1] material -> relational: ascriptive

Alongside examples such as the following

> Gains in factory stock and those at retailers should be partly offset by a decline in new car inventories (FRB)

where the material process of offsetting is represented as the Process of a clause, we find examples where the process is represented as the Attribute / Range of an ascriptive relational clause:

> The shortfall of tax refunds could be partly offsetting (FRB)

[b:2] mental: reactive, cognitive -> relational: ascriptive

In the case of reactive and cognitive mental clauses, the metaphorical representation of the process as a range is achieved by a shift to the grammar

of ascriptive relational clauses: the mental process, the sensation, is represented as an attribute in an ascriptive relational clause and the senser or the phenomenon is represented as the attribuend. For example,

Who *fears* Virginia Wolf

is represented metaphorically as

Who *is afraid of* Virginia Wolf

There is thus a proportion such that

err : make an error :: fear : be afraid of

The metaphorical relational clause may be either intensive or possessive; i.e. the senser may either be or have the sensation.

i. intensive

middle: Senser as Attribuend -- 'fear' ~ 'be afraid of'

He was afraid that unless he did so the 11th Division might be destroyed. (Farrell, p. 295) 'He feared that ...'

effective: Phenomenon as Attribuend -- 'frighten' ~ 'be frightening'

The new developments were very frightening to all of us.

ii. possessive

middle: Senser as Attribuend

I have a fear of snakes
I have an aversion to sea cucumbers

but I *have* the strongest *belief* that things will very soon be quite all right. (Christie, 93)

but he *had* a secret *admiration* and *respect* for those who did (Christie, 176)

(This type also includes metaphorical representations of perceptive mental processes: see ~ have a vision of, have a feeling, have a sense, etc..)

effective: Phenomenon as Attribuend

but it was a world that *held attraction* for her nevertheless. (Christie, 42)

The Commandos *had an irresistible fascination* for me. (Christie, 44)

[b:3] material, mental -> relational, as circumstantial Attribute/Range

We have seen that mental processes are represented metaphorically by means of intensive or possessive relational clauses. Material and mental clauses may also be represented metaphorically by means of circumstantial relational clauses: the congruent process is represented as a circumstantial Attribute / Range. More specifically, the process is represented in terms of a

metaphorical space, in which the participant represented as the Attribuend is located. For instance, alongside

The general commands the troops

we have

The general is in command of the troops

Further examples:

Five of his political organizations *are* also *on trial* on charges of conspiracy to obstruct the federal investigation. (LAT, 18/xii/87) 'are being tried'

The westerlies, however, *are* always *in collision* with the frigid polar easterlies to the north, and as a result the weather of North America is unstable and sometimes harsh. (The Atlantic) 'collide'

Mr Wu's Buick, which had *been under repair* for some days, was now on the road again (Farrell, p. 485)

Singapore Island (which, if you recall, resembled the head and ears of an elephant on the map in General Percival's office) *was* now *under siege*. (Farrell, p. 515)

Similar examples include:

be under investigation, be under [the] influence [of ...], be under [the] supervision [of ...]; be in control; be in pain, be in agony, be in trouble, be in fear of, be in [the] belief [that ...], be under [the] impression [that ...], be in doubt, ...

(ii) complex process

When the congruent Process is simple, it is represented as the Range in its entirety and the Process of the metaphorical version is a very general one such as 'do', 'have', or 'be'. When the congruent Process is complex, the nature of metaphorical representation depends on whether the congruent verbal group complex is (a) an expansion; or (b) a projection.

(a) expansion: conation

If the congruent verbal group complex is an expansion, the å of the complex corresponds to the process in the metaphorical version and the ∫ to the participant.

conation:

> The Coroner said graciously: "I have heard of you, M. Poirot," and Poirot *made* an unsuccessful *attempt* to look modest. (Christie, 149) 'tried unsuccessfully to look'

(b) projection

If the congruent complex is a projection (intention: 'plan', etc.), the α of the complex (the non-dependent clause) may correspond to the process in the metaphorical version and the β (the dependent clause) to the participant.

> Underhay actually *planned* a pretended *death* (Christie, 149)
> With an effort Rowley *recalled* his *thoughts* and answered: ... (Christie, 69) 'recalled thinking'

The whole congruent process may also correspond to a range in a possessive clause.

> I mean that five - six - seven people *have* [*every intention* to hurry you into your grave before you're due there]! (Christie, 61)

> A murderer who escaped two weeks ago has sent a letter of apology to the head to the state's prison system, but he said he *has* [*no plans* to return]. (LAT)

(3) (Part of) process as circumstance

A process congruently represented as a phased verbal group complex, α ('start') β ('to do'), may be represented metaphorically as a process plus a circumstance. The congruent phased verbal group complex may be either noncausative ('start to do') or causative ('start sb doing'). In either case, the phase, α ('start'), is represented metaphorically as a process of motion and the event in phase, β ('to do'), as the destination of the motion. Examples include coming, slipping, driving, and bringing:

complex process

elaboration: phase

> while its neighbors have *slipped into seedy socialist decay* ... (Wyatt, 277) 'come to decay'

> and the Socialist party *came to seemingly permanent prominence* (Wyatt, 278) 'became seemingly permanently prominent'

> Rosaleen looked up smiling, then her face *changed to an expression of alarm.* (Christie, 73)

She *came* quickly *to the rescue* of his embarrassment. (Christie, 30)

... + causation

Men who were worth their weight in gold in a pinch -- and who *drove* C.O.s *to distraction* out of the firing line! (Christie, 38)

However another letter from the Bank Manager that morning had *driven* Mrs. Marchmont *into positive action.* (Christie, 49)

and now I have *brought* him *to his death - an ugly sordid death* (Christie, 186)

When I thought of this scheme I had no scruples at all about *putting* it *into operation.* (Christie, 186)

I *sent* him *to his death.* (Christie, 187)

As these new rings are *brought into operation* a large community of workers in basic and applied research will be able to tackle many known phenomena that are inscrutable to investigators employing current sources of radiation. (Sc. Am. xi/87) 'are made to operate'

3.3.5.3.2 Metaphors providing alternative classifications

A small group of metaphors provide an alternative classification without a reconfiguration of the congruent configuration. The most important type is a reclassification within relational clauses from intensive to possessive. Examples include:

Her plain red face *had great kindliness,* and more idealism than kindliness, and more generalship than idealism. (Wilder, p. 32) 'was very kindly'

The kingdom *retains a paradoxical sort of national independence*. (Wyatt, 277) 'remains ... independent'

He *had a slowness that seemed more purposeful than ingrained*. (Christie, 33) 'was slow'

The cyclic-GMP *has* a *significance* that extends even beyond vision. (Scientific American) 'is significant'

The exciting cascade in rod cells *has* a notable *resemblance* to the pathway by which certain hormones shield their effects. (Scientific American) 'is notably similar'

As the examples illustrate, the metaphorical strategy opens up the potential for modification such as postmodifying relative clauses.

3.3.5.4 Nominal group

If a clause or part of a clause is represented metaphorically as a nominal group, participants and circumstances will be represented by (rankshifted) groups and phrases serving as qualifiers (or Deictic). However, the resources of the nominal group allow for an additional step in metaphorizing: the participants and circumstances may be re-represented as adjectival or nominal premodifiers; for instance:

(step 1, congruent:) translate into Cambodian;

(step 2, metaphorical:) translation into Cambodian;

(step 3, additional metaphorical step:) Cambodian translations

Similarly:

```
elementary-particle collisions
income growth
the factory inventory report
strong auto demand
```

This step makes it possible to establish taxonomies of reified processes (*elementary-particle collisions, atomic collisions,* etc.). We can see this additional step as internal to the nominal group, since it does not affect the organization of the unit the nominal group is part of. (Circumstances of qualitative manner are, of course, regularly represented by means of adjectival premodifiers.)

3.3.5 Conclusion

The major thrust of this section has been descriptive. It is a step towards a state where we can see the various alternative ways of integrating grammatical metaphor into a generation system. It is likely that we will operate with approaches to grammatical metaphor on a case by case basis rathen than take on grammatical metaphor as a whole. It is thus essential to have a sense of what the cases are and what approaches are available for each.

I will leave grammatical metaphor here and turn to a different kind of extension to the basic grammar -- an extension in delicacy. However, once I have discussed the basic semantic interface, the chooser and inquiry interface

developed for the Nigel grammar, I will return briefly to grammatical metaphor in Sections III:4 and III:5. The general strategy will be to bring together semantically what is separated in the grammar because of grammatical metaphor.

4. Lexis

In the previous section I considered extensions to the basic Nigel grammar. These extensions moved towards increased metafunctional capability as well as towards grammatical metaphor, staying within the grammatical part of lexicogrammar. I will now consider another kind of extension to the basic grammar, an extension in delicacy: I will explore the lexical extension of the grammatical part of lexicogrammar.

4.1 Lexis in Nigel

I will start with the approach to lexis in Nigel, focussing first on ideational aspects of lexis, since that is the only metafunctional aspect of lexis being controlled at present. Assume that the grammar is generating *Prepare some small rolls.* In the first cycle through the grammar, the clause network is traversed, including the transitivity network --

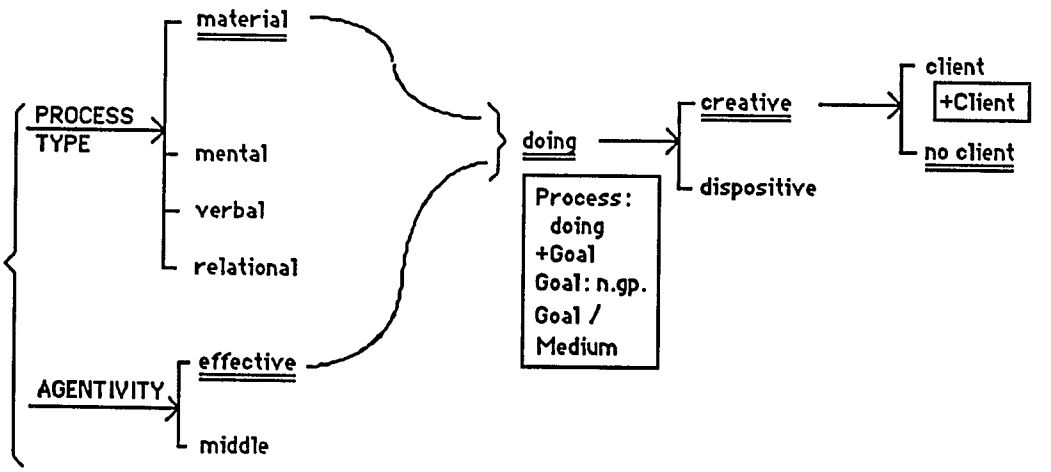


Fig. II:4-1: Transitivity network for generating example

-- and the clause structure is generated. The features selected are underlined in the system network above; the most delicate transitivity choice is the decision not to specify a client (the selection of 'client' would have produced examples such as *Prepare me some small rolls* and *Prepare some small rolls for me*). The function bundles are realized according to the preselected grammatical features associated with them. The Process is realized by a verbal group and the Goal / Medium is realized by a nominal group. The subnetworks for these groups are traversed and their structures are developed:

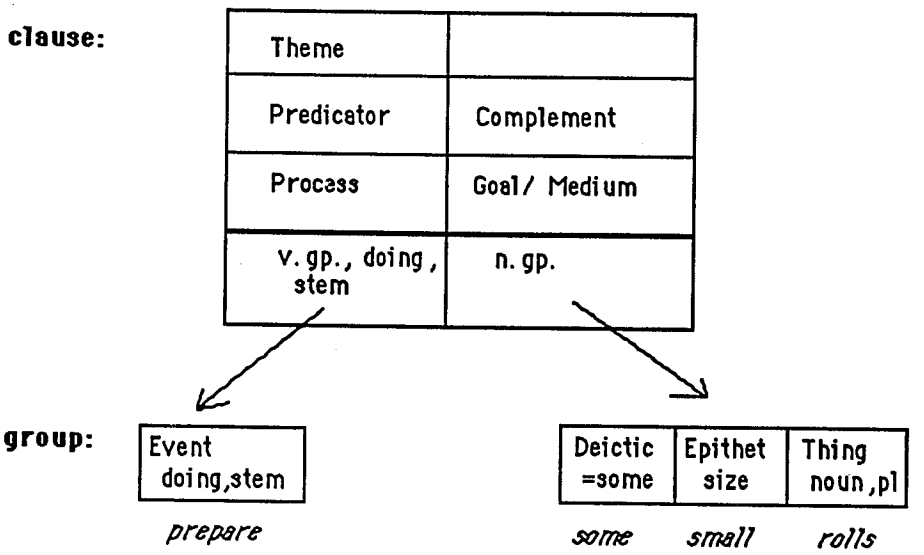


Fig. II:4-2: Lexical features associated with group functions

The group functions in our example are realized by sets of lexical features or by lexical items. The function Deictic is realized by a single unique lexical item, *some,* by means of the realization operator Lexify (Section II:2). The other grammatical group functions have lexical feature sets associated with them as a result of the application of the realization operator Classify (Section II:2) -- Event: {doing, stem}, Epithet: {adjective, size}, and Thing {noun, plural}. These features specify sets of lexical items rather than unique lexical items.

As we can see from the example, the Nigel grammar does not show what the lexical alternatives are for these three sets; the grammar does not extend in delicacy to include the lexis part of a unified lexicogrammar (Section I:1.2). Instead, it relies on the knowledge base taxonomy to make the necessary lexical differentiations. For example, consider the task of selecting *small* in

some small rolls. The grammar will only go as far as the specification Epithet: {adjective, size}. In the knowledge base, there is a taxonomy of quality concepts. One of them is 'small' and *small* is associated with this concept (cf. Matthiessen, 1981);[1] see the figure below.

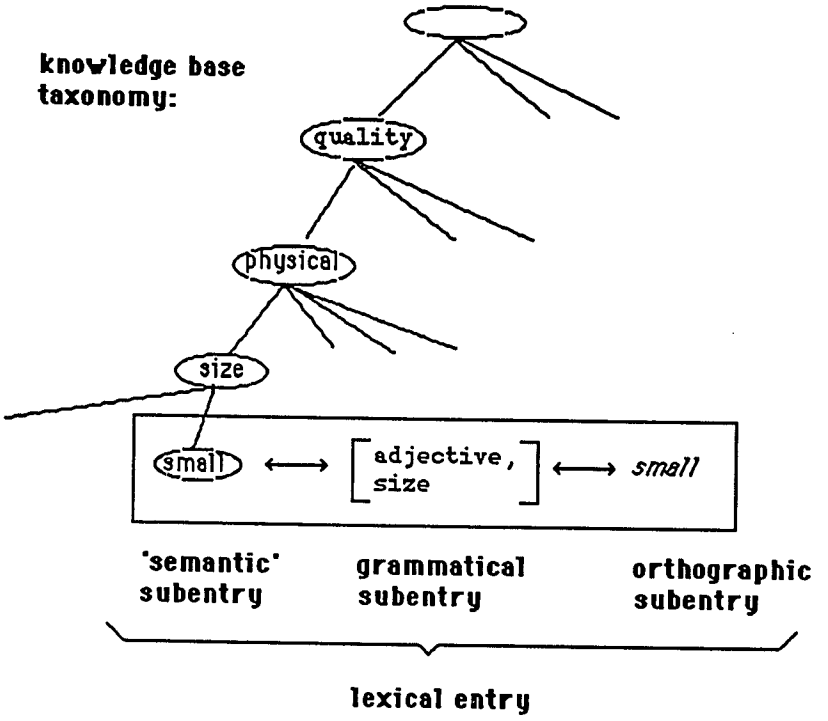


Fig. II:4-3 : Lexical association and entry of *small*

The concept 'small' is used as a predicate in the predicate-logical form that specifies the information to be expressed. Since *small* is associated with the concept, *small* can be given in response to the inquiry TermSpecificationID asked of Epithet -- (TermSpecificationID Epithet) "what lexical items can be used to name the concept 'small' associated with Epithet?", if we imagine that the response is calculated simply by looking up the entries in which the concept

[1] The relation of association is like that of REF used by Jacobs (1987). The REF relation holds between a "conceptual" frame and a "linguistic" one.

'small' participates.[2]

As we have seen, the grammar is related to the knowledge base (as it is to other components of its environment) by means of the chooser and inquiry interface. The locus of control in this interface is the grammatical system network: each system is equipped with a chooser that can present one or more inquiries. The lexical interface is, as we have just seen, different from the grammatical one. Instead of being system-based, it is item-based: each lexical item is associated with a concept in the knowledge base in the way illustrated for *small* above.[3] This difference is diagrammed below.

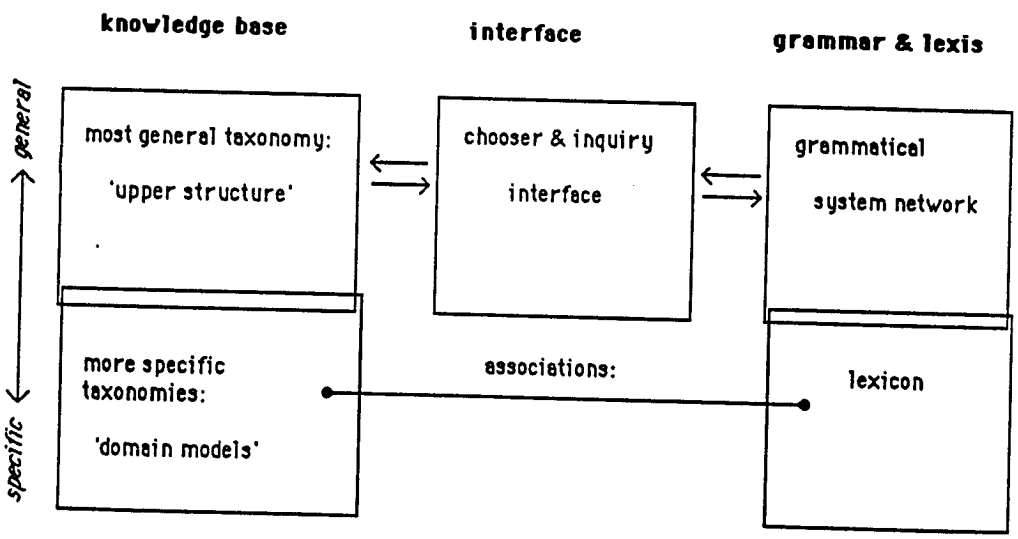


Fig. II:4-4: Interfaces for grammar and lexis in Nigel

[2] In this case, it may seem that the grammar gets fairly close to actually specifying a feature or set of features that would uniquely identify *small*. However, the situation is quite different with e.g. nouns where the taxonomic depth tends to be much higher; i.e., many more steps must be taken in delicacy before a particular lexical item can be uniquely determined.

[3] In a sense, the lexical interface includes only a device corresponding to the identifying inquiries of the grammatical interface, but no device corresponding to the branching inquiries.

According to systemic theory, grammar and lexis are related as general to specific (see further Section II:4.5 below) and this is reflected in what parts of the knowledge base they relate to: grammar interfaces with the most general part and lexis with more specific parts of the taxonomy of concepts.

In our example, the choice of *small* seems straightforward, since the concept 'small' has been identified and there is only one lexical entry in which it participates. However, there are a number of reasons why this simple situation may change:

(i) we may ask what it means to choose *small* / 'small' in the first place, beyond looking up the lexical item associated with a concept -- for instance, how do we handle interpersonal and textual selectivity?;

(ii) the concept 'small' might participate in more than one lexical entry -- *small, puny, tiny,* etc.; cf. *big* vs. *large* -- and if so what will provide the appropriate selectivity?

(iii) we may need to access lexical items not directly associated with the current concept.

The last possibility is exemplified in the following expository text.

> *The Monoclonius* (mon-o-KLON-ee-us) also had a large horn sticking out of its nose, and two bony growths just above its eyes. *These horned dinosaurs* had good natural weapons to use against their enemies. (Dinosaurs)

The first mention of the creature uses *monoclonius,* but the second mention switches to *dinosaurs* modified by *horned.* This exemplifies the common lexical cohesive strategy of moving up to select a term for a non-initial mention (Halliday & Hasan, 1976: Ch. 6; see Section II:4.9 below). Imagine that we have a simple taxonomy of dinosaurs, divided into meat-eaters and plant-eaters, including Monoclonius and Camptosaurus. Terms can be selected from the various levels in the taxonomy, as indicated by the arrows in the diagram below:

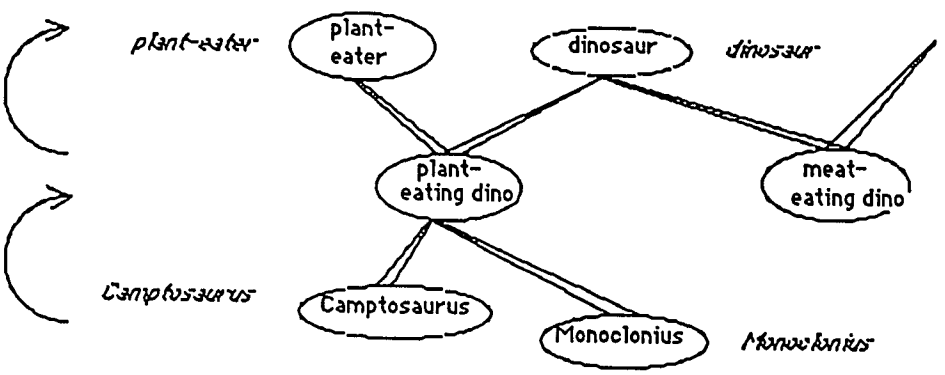


Fig.II:4-5: Alternative taxonomic levels in lexical selection

In the example already given, the term *dinosaur* was selected from the top level. But there is also the option of choosing from the intermediate levels and other hierarchies. In the following example, the second mention refers back to Camptosaurus, but at the same time as it ascribes it to the class of plant-eaters: Camptosaurus is a plant-eating dinosaur, which is both a dinosaur and a plant-eater. Its inclusion in the class of dinosaurs has been established, so the lexical item *plant-eater* can be used:

Camptosaurus (kamp-toe-SAWR-us) probably provided many a fine meal for the fierce Allosaurus. *This plant-eater* was only 7 to 18 feet long. Its long, flat skull was shaped differently from the heads of earlier dinosaurs. It could walk on either two feet or four. (Dinosaurs)

These examples illustrate the fairly obvious observation that lexical choice involves more than simply selecting the term associated with a particular concept. Although Nigel could retrieve lexical items from associations at the various levels in the taxonomy, it would not be able to exercise the kind of choice just illustrated.

There is another important consideration. There is continuity between grammar and lexis; grammatical properties are often associated with small lexical classes or even individual lexical items and the simple model presented above does not give us any way of integrating these facts with the general grammar. This continuity between grammar and lexis will be illustrated in Section II:4.5.

We also have to take into account the modularity of the generator. While the grammar and its interface are independent of any particular way of representing information in the knowledge base as long as appropriate responses can be given to the inquiries of the semantic interface, lexis becomes largely dependent on particular domain models and the knowledge representation notation they are stated in. As a result, lexical semantic information is not a portable part of the system, but is tied up with the knowledge base.

I could go on to examine further problems for the simple 'baseline' Nigel approach to lexical selection. But since very little work has been done on lexical selection in Nigel beyond the basic skill of denoting a concept, it is more productive to leave this approach for the time being and take a more general look at the lexical needs in text generation. In general, I will explore an abstract systemic model of lexis as part of lexicogrammar. This model can be implemented in various ways, of course; one way would be to extend the current approach to lexis in Nigel as far as possible.

4.2 Lexis in text generation: needs and approaches

4.2.1 Lexical needs in text generation

In a contribution to a panel discussion on text generation, Marcus (1987) observes about natural language generation systems:

> Such systems operate by incrementally specifying fragments of linguistic structure in a top-down fashion, typically inserting specific lexical items only when the frontier of the structure is encountered. In some important sense, these systems have no real knowledge of lexical semantics and only rarely make lexical choices. ... The alternative, which we must face up to sooner or later, is to attack the closely related problems of lexical semantics and lexical choice directly.

The basic issue identified by Marcus is the problem of dealing with *lexical choice*.[4] We may disagree with his characterization of the state of work on

[4] Another aspect of what Marcus criticizes seems to be what Halliday has called the bricks and mortar view of words and syntax (cf. bricks and edifice in Halliday, 1961: 279). I will return to this issue in Section II:4.5.

lexical selection in text generation in details or more generally: for instance, the typical approach to lexical selection is arguably not the one of Marcus' characterization; rather, lexical choice often precedes the process of grammatical expression in text generation systems. However, Marcus does point to a central problem or rather cluster of problems that have come into focus in work on text generation but have not been discussed in a general way.

Certain subproblems have received attention -- for example, the relationship to the knowledge base (e.g., Matthiessen, 1981; McDonald, 1981), lexical repetition (Granville, 1983), some type of 'idioms' (Jacobs, 1985), and audience considerations (Hovy, 1987). What we need to do now is to take stock of the various approaches that have been developed and to relate them to an abstract general characterization of lexical choice and lexical resources.[5] Such a characterization can then serve to guide us in further work on lexical choice and lexical organization in text generation. This paper is offered as a step in that direction.

We can begin by asking three related questions:

(i) how lexical choice is related to other processes in generation, in particular to grammatical choice & expression;

(ii) how to organize the process of lexical choice internally;

(iii) what factors influence lexical choice. And, since there are several

[5] Purstejovsky's & Nirenberg's (1987) short discussion of "lexical selection in the process of language generation" serves to underline this need rather than fill it. They rely on the traditional distinction between open class lexical items and closed class ones and, within the latter, they distinguish between discourse oriented closed-class items (e.g. determiners and pronouns) and proposition oriented ones (e.g. [most] prepositions and modal auxiliaries). Although presented as a new type of distinction, it is not, of course: it has a long history in linguistics. Further, it is just one small part of the problem of lexical selection and we need to attempt a much broader survey that serves to relate the problem to current and previous work.

factors: how to integrate & reconcile the various factors so that a unique choice can be made.

I have asked these questions in terms of processes; but we also need to ask the corresponding resource questions: how are the lexical resources related to other resources in a generator; what is the internal organization of lexis; and what are the functions of lexis? These three issues are the central ones; there are also a number of related subproblems, such as:

(iv) how to handle potential mismatches between grammar and lexicon (such as the lexical unity of phrasal verbs, *put off* = 'postpone', *call off* = 'cancel', etc., which are grammatically 'divisible': *let's put it off*);
(v) how to handle lexical choices that are collocationally conditioned (such as *wreak + havoc, do + harm; gaggle + geese, school + thought;* and *drop + temperature*);
(vi) how to handle lexical items above word rank and 'idioms' of various types (such as *x is y if x is a day, fly off the handle, blow one's cool*).

4.2.2 Approaches to the issues

Let's start by considering what approaches to the issues identified above have been or could be taken in text generation.

4.2.2.1 Lexical choice in relation to other generation processes

I will consider two approaches to the relationship between lexical choice and grammatical choice & expression: (i) Lexis and grammar are independent components and the processes associated with them are similarly separated and (ii) lexis and grammar constitute one unified resource and there is essentially one process of selection.

(i) Lexis and grammar are independent components. One common strategy is to *start by lexical choice* and then to move onto grammatical choice and expression; we find this approach in e.g. Goldman's (1974) BABEL, McDonald's (1980) MUMBLE, and McKeown's (1982) TEXT. Lexical choice is, more specifically, *ideational lexical choice;* the first step is to select a verb with a case frame, which will then be turned into a clause by subsequent grammatical processing (cf. Figure I-7).

In Goldman's BABEL, lexical selection produces word senses of lexical items & case frames, which are then passed off to surface generation, based on an ATN grammar. McDonald divides generation in MUMBLE into two stages; the first deals with lexical selection in the dictionary and the second turns to the grammar.

Similarly, in TEXT, the dictionary is ordered before the tactical component. The dictionary interface produces a 'deep structure' with lexical items. This information is represented in terms of functional unification grammar descriptions and these descriptions are the input to the tactical component,

which uses a functional unification grammar. In this second stage, the lexical information is unified with grammatical descriptions.

This approach to lexical selection in relation to 'syntactic' generation is also very much along the lines of Dik's (1978, 1987) Functional Grammar: predicate frames are selected from the lexicon, they are instantiated and expanded and are then passed on to the syntactic and pragmatic components.

(The other alternative is to create grammatical structure first and then to fill it in lexically.)

(ii) Lexis and grammar are one unified resource. The approach just sketched can be contrasted with one where lexis and grammar constitute one unified resource. There are two complementary perspectives: (1) viewing this resource from lexis; or (2) viewing it from grammar.

(1) We can look at this either from the lexical end and treat most everything as lexis,[6] as e.g. Hovy (1987) does for generation and, in another context, Sinclair and co-workers in the Birmingham group do in their work on lexical analysis (e.g., Sinclair, 1987), following up systemic work on lexis started in the 1960s (cf. Halliday, 1966; Sinclair, 1966).

In computational linguistics, the lexical perspective was inspired by Becker's notion of the phrasal lexicon -- a lexicon with a large number of "lexical phrases" of various types.[7] This is how Becker (1975: 62) suggests that it

[6] The metaphor is often that everything is 'in the lexicon'. However, I think the picture is clearer if we see this as approaching lexicogrammar from the lexical end.

might be used in language production.

We start with the information that we wish to convey and the attitudes toward that information that we wish to express or evoke, and haul out of our phrasal lexicon some patterns that can provide the major elements of this expression. Then the major problem is to stitch these phrases together into something roughly grammatical, to fill in the blanks with the particulars of the case at hand, to modify the phrases if need be, and if all else fails to generate phrases from scratch to smooth over the transitions or fill in any remaining conceptual holes.

My guess is that phrase-adaption and generative gap-filling are very roughly equally important in language production as measured in processing time spent on each, or in constituents arising from each.

Following these ideas, Hovy (1987) suggests that the lexicon contains specific phrases as well as more general patterns:

Taking this view seriously, I believe that all formative aspects of language should be treated as phrasal. Multi-predicate phrases, formative rules of grammar, and words with idiosyncratic formative requirements -- all entities that deal with the ordering of words and syntactic environments -- should be contained in the lexicon as frozen, semi-frozen, and very general phrases. The lexicon should be the sole repository of the patterns that make up language --

[7] Becker (1975) identifies six major categories: (i) polywords (e.g., *blow up* 'explode'), (ii) phrasal constraints (e.g., *by pure coincidence*), (iii) deictic locutions (e.g., *for that matter* 'I just though of a better way of making my point'), (iv) sentence builders (e.g., *[A] gave [B] a (long) song and dance about [C]* 'A tried to convince B of something, and was cynical and perhaps less than truthful about what he said'), (v) situational utterances (e.g, *How can I ever repay you?*), and (vi) verbatim texts (e.g., *Better late than never*).

some very specific, some very general.

"Taking this view seriously" leads to the inclusion of "multi-predicate phrases" such as *not only -- but,* in the frame

[*not only* [SENTENCE (verb relocated, with *"do"*)], *but* [SENTENCE]]

as well as one-word lexical entries. If this means recording the 'inversion' of Subject and Finite (realized by *do* or another auxiliary) in a number of different lexical entries, there is, of course, a good deal of repetition and we miss the principle that thematic negative (clause) polarity always leads to the sequence Finite ^ Subject.

In text generation, the approach from the lexical end is likely to be useful if we are faced with a specific generation task such as generating stock-market reports: cf. Kukich's use of a phrasal lexicon, inspired by Becker's notion of the phrasal lexicon, in her Ana generator.

(2) Alternatively, we can look at lexicogrammar from the grammatical end and view lexis as the more specific part of lexicogrammar (Halliday, 1961). I will return to this approach below.

In systemic linguistics, we can distinguish the same two broad alternatives as above in the relationship between lexis and grammar:

(i) Lexis and grammar are independent levels.

(ii) Lexis and grammar are the same level and are related by delicacy: lexis is most delicate grammar -- the grammarian's dream.

Both alternatives have been discussed, but they are not different models of the relationship between lexis and grammar. The first is an approach to the analysis of lexis that allows us to get on with the work, particularly in large-scale text-based studies, even though grammar and lexis have not been integrated. In contrast, the second is a hypothesis about the integration of lexis and grammar and this model of the integration allows us to state the findings of the first approach with the aid of the grammar. I will give examples later of how the categories of the grammar can be used to capture certain lexical collocational classes.

The approaches to lexis and grammar just discussed are summarized diagrammatically below:

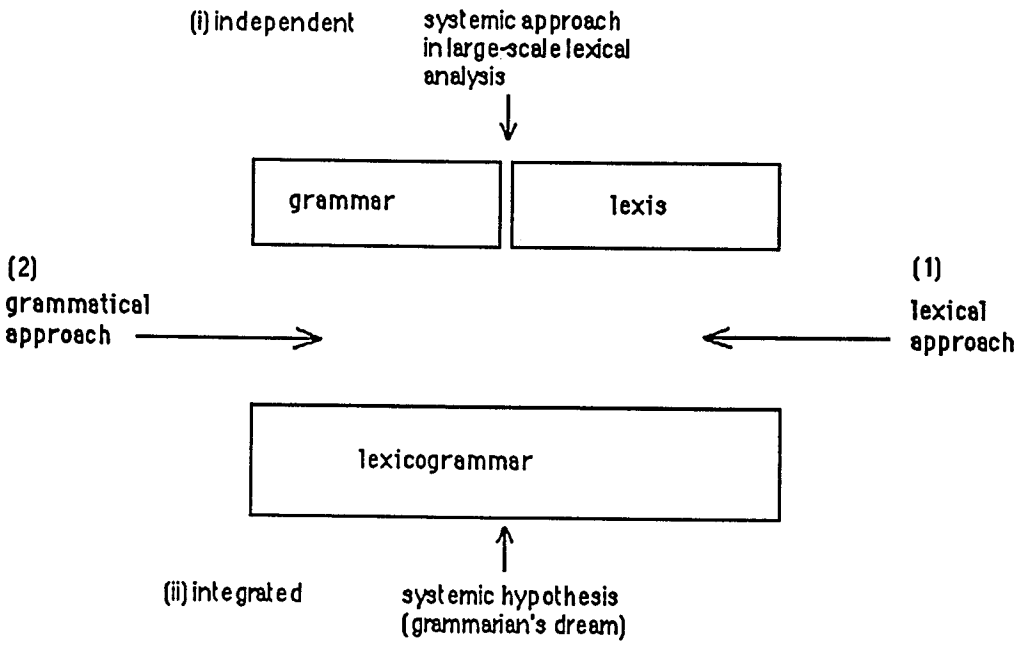


Fig. II:4-6: Approaches to lexis + grammar

The lexical approach to lexis as an independent level has been very useful in extensive lexical analysis. In linguistic analysis, descriptive statements can be accumulated without having to be tightly integrated. It is often sufficient to offer a grammatical perspective on a text and then to add a lexical perspective. In generation, lexis and grammar have to be tightly integrated even if they are independent levels.

4.2.2.2 The internal organization of lexis

There are essentially two approaches to the internal organization of lexis, both of which derive from traditional lexicographic models:

(i) the dictionary: a collection of lexical entries; the lexicon component of generative models and many NLP systems.
(ii) the thesaurus: semantically oriented taxonomy of lexical items; this is a rough model of systemic lexis.

(i) The dictionary. The dictionary treats lexis as a collection of *lexical entries*, usually listed alphabetically. It developed originally not in response to the writer's needs to express himself or herself but as bilingual glossaries and lists of "hard" or foreign words.

The dictionary is better known, more widely understood, and more widely used than the thesaurus and it is the model that has been incorporated into various generative theories of language as the 'lexicon'.

In the modern dictionary, there is a good deal of organization beyond the alphabetical listing, of course, but it remains implicit in e.g. the vocabulary used in dictionary definitions (see e.g. Amsler (1981), who has analysed the organization of the Merriam-Webster pocket dictionary). When the dictionary is taken as the model for semantic memory, as Quillian (e.g. 1966) did when he developed the semantic net, and the organization of the dictionary is made explicit by associative links, each lexical entry is still the hub of organization.

There is no taxonomic root from which a tree grows, as there is in the thesaurus, and it took a while in the work on knowledge representation before the taxonomic relation was given special significance, as it is e.g. in Brachman (1978).

As noted, the dictionary has been the model for the lexicon of formal linguistic theories; it is also the model that has been used in natural language processing systems in general and in Nigel in particular. In other words, it is the default choice and would thus appear not to need any special justification.

I mentioned that the dictionary model is the default choice in natural language processing. But I think we can identify other reasons why the possibility of a systemic (formal) lexis for Nigel has not been explored. I will only mention one,[8] that there is already a conceptual lexical taxonomy in the knowledge base (see Figure II:4-3 above) and the creation of a lexical network in lexicogrammar is simply seen as doing the same job again without any gain. This may be the case in small one-register generators, but an important reason for having both a formal lexis in lexicogrammar and lexical semantics in systemic theory is, of course, precisely that it is not tantamount to doing the same job twice. For example, there are situation-specific semantices (i.e. register-variable), but lexicogrammar is not situation-specific according to systemic theory.[9] This reason is perhaps not likely to emerge very clearly in present work on text generation where a system is usually confined to a single or small set of 'toy'-size fields.

[8] Another reason would be the possibility of the independence of lexical and grammatical generalizations; cf. the observations made in Halliday (1966), which are not, however, arguments against the grammarian's dream.

[9] A text may even operate with its own contrasts of instantial lexical meanings; cf. Fries (1984).

(ii) The thesaurus. In contrast to the lexicon, the thesaurus treats lexis as a resource of related lexical alternatives. It is this model that suggests what systemic lexis is like. Roget's thesaurus is a strict taxonomy but it can nevertheless serve as a rough guide to what a lexical system network might look like. The thesaurus has not usually been incorporated in natural language processing systems, which is not to say that it would not be useful. The thesaurus was explored as a tool in machine translation in Masterman's early machine translation project in Cambridge -- cf. for example Halliday (1956) and Sparck-Jones (1964/86); but it has not been used as a model in text generation, with the partial exception of Goldman's (1974) approach to lexical selection.

The dictionary and the thesaurus are not mutually exclusive, but are rather complementary perspectives on lexical organization: the question is which is more helpful in text generation. They arose to serve different purposes. As noted, the dictionary started as a translation aid and as a glossary for 'difficult' words. The thesaurus, on the other hand, started as an aid in expressing thought; Roget stated the object of his thesaurus as follows (from the introduction to the original edition of 1852):

> The present Work is intended to supply, with respect to the English language, a desideratum hitherto unsupplied in any language; namely, a collection peculiar to it, arranged, not in alphabetical order as they are in a Dictionary, but according to the *ideas* which they express. The purpose of an ordinary dictionary is simply to explain the meaning of the words; and the problem of which it professes to furnish the solution may be stated thus: - The word being given, to find its signification, or the idea it is intended to convey. The object aimed at in the present undertaking is exactly the converse of this: namely, - The idea being given, to find the word, or words, by which that idea may be most fitly and aptly expressed. For this purpose, the words and phrases of the language are here classed, not

> according to their sound or their orthography, but strictly according to their *signification*.

In a sense, then, Roget designed his thesaurus for text generation, while the dictionary is designed as a supplement to traditional grammar, which is concerned with the signification and uses of grammatical forms.

The dictionary and the thesaurus can be seen, then, to serve different uses. They are different views on lexical organization. The thesaurus is *system-based* while the dictionary is *item-based.* In principle, we should be able to compile a dictionary from a system-based organization of lexis by collecting all the information available for each lexical item. Now, if lexis and grammar constitute one unified resource -- lexicogrammar -- there should be a grammatical equivalent to the lexical dictionary and it turns out that there is. In parsing, where we can expect the dictionary view of lexis to be helpful, we can compile grammatical tables from the system-based grammar about particular items. For instance, Kasper's Nigel parser operates with a table -- a 'dictionary' -- of grammatical functions which lists all the conflations for any given function. It is thus possible to look up the function Subject in this table and find Subject / Agent, / Medium, / Beneficiary, and so on together with the appropriate paradigmatic contexts in which the conflations occur.

Although we might expect to see thesauri in most generation systems, we find dictionary (lexicon) components. Goldman's (1974) BABEL generator is an important exception, in which lexis is organized in a thesaurus-like fashion by means of discrimination nets and the process of lexical choice is one of

stepping through these discrimination nets (cf. also Pustejovksy & Nirenberg, 1987, who suggest the use of discrimination nets for the selection of open class lexical items; it is not clear whether their use differs substantially from Goldman's, since they do not discuss his work).[10]

I will explore the consequences of using the thesaurus rather than the dictionary as a model in text generation: as Goldman's work shows, the thesaurus can help us organize the lexical resources and the process of lexical choice.

4.2.2.3 Factors and functions

We can distinguish two broadly different approaches to the functions lexical resources serve: (i) unifunctional -- the focus is on one type of function; and (ii) multifunctional -- several functions are in focus.

(i) Unifunctional. Past work on text generation has almost exclusively been unifunctional. More specifically, it has paid attention to the function of representation, i.e., the denotation of lexis: there is typically some kind of mapping between a terminological concept in the knowledge base of the system and a lexical item, as in McDonald (1981), Matthiessen (1981), McKeown (1982), and Jacobs (1985).

[10] In generators operating with a dictionary, the taxonomic, thesaurus-like organization of vocabulary may be reflected in the organization of the 'terminological' component of the knowledge base of the system or presupposed by the system.

(ii) Multifunctional. In contrast, a multifunctional approach goes beyond the function of representation and takes into account other functions as well. With a few exceptions such Hovy's (1987) work lexical choice and 'affect' and Granville's (1983) work one type of lexical cohesion (repetition), the multifunctional approach has not yet come into focus in work on text generation and I will discuss it below.

4.2.3 Organization of the rest of the discussion

I will start with the first two basic questions identified in Section II:4.2.1 and then move on to the third one. I will explore the subproblems as I go along. The rest of the discussion is organized as follows:

(0) An abstract, overall model: Section 4.3.

(i) The internal organization of lexis on the model of the thesaurus: Section 4.4.

(ii) The relationship of lexis to grammar: Section 4.5: as an extension of grammar in delicacy

(iii) What factors influence lexical selection? Section 4.6: interpersonal and textual lexis

The answers to the first two questions that I will explore are the systemic ones: lexis is organized on the model of the thesaurus and it is related to grammar through delicacy. The purpose of Section 4.5 is to take a bird's eye view of English to see how far the systemic answers can take us. This section is thus

mainly descriptive.

The answer to the third question is again a systemic one: the factors that influence lexical selection derive from the three metafunctions; there are ideational factors, interpersonal ones, and textual ones. While the sections up to Section 4.6 deal mostly with ideational aspects of lexical organization, this section examines interpersonal and textual aspects.

4.3 An abstract model

I have sketched some of the dimensions of the 'space' in which approaches to lexis and lexical choice can be located. I will now sketch an abstract model for text generation which contrasts with a good deal of the past work in text generation and thus can serve to identify issues for future work. The model is abstract in that it does not constitute a concrete implementation; as will be noted, there are various ways of implementing it. Since it is abstract, it can be more general and cover more ground than any given implemented model can afford to do: implemented models are simplified according to the particular generation task or set of tasks they have been developed for. At the very least, I hope the abstract model may be useful as a 'checklist'.[11]

The abstract model used here is a systemic-functional one; it is an attempt to specify the general aspects of the organization of ***functional lexis*** as seen

[11] When we consider the feasibility of the abstract model in the context of text generation, it is important to remember that the lexical repertoire of any present-day generation system will be very small and limited: problems of sheer lexical bulk are not important yet.

from functional grammar. In general, it assumes that the boundary between the strategic and tactical parts of a generator does not fall in such a way that grammar and lexis are merely tactical: strategic considerations are embodied in grammatical and lexical choices and 'tactics' is a matter of the realization of these choices.

Very briefly, lexis is an aspect of the multifunctional resource of lexicogrammatical choices available to the speaker. Furthermore, all of lexicogrammar is covered by a uniform semantic interface. This interface may take the form of the chooser and inquiry interface developed for systemic generation grammars or it may take some other form such as a semantic system network. According to the three dimensions discussed in the previous section, the abstract model has the following characteristics.

(i) The model relates lexis to grammar as specific to general; lexis and grammar constitutes one unified resource -- *lexicogrammar* -- and lexis is merely the most specific or delicate end of it but not necessarily the smallest; lexical items may be clauses and groups as well as words -- idioms of various kinds. Further, many collocations studied in terms of lexical functions in the Meaning-Text Theory (e.g. Melchuk, 1986) and in terms of transcendental particles in Wilkins (1668), a work that contributed to Roget's thesaurus, and which are important to handle in generation turn out to be related to the categories of the grammar and applicable to lexical classes instead of individual lexical items.

(ii) The model organizes lexis on the model of a thesaurus, with the important differences that it is organized as a *system network* rather than a discrimination network, that it is organized in terms of the categories of the grammar, and that it is multifunctional rather than unifunctional (the thesaurus is unifunctional; its taxonomy is ideational).

(iii) The model is *multifunctional;* lexis is textual and interpersonal as well as ideational, to put it in terms of the metafunctions of systemic theory. Just as a fragment of grammatical structure, a lexical item may realize selections within one of the metafunctions --

ideational: `alongside`
interpersonal: `unfortunately`
textual: `the`

-- but it may also realize more than one metafunction simultaneously; for example:

ideational	interpersonal	
'complain'	'disapproval'	whine
'newspaper'	'disapproval'	rag

(As we will see below, we also find combinations with the textual metafunction; but the textual contribution has to be interpreted in context; it cannot be set up as an invariant component of a lexical item.)

The three metafunctions relate to different *contextual factors* that influence lexical choice, such as technicality of the domain (ideational), the relationship between speaker and listener -- affect, formality, etc. (interpersonal), and spoken vs. written (textual: degree of lexical specificity & 'density'). If the lexical systems of the system network are equipped with semantic choice processes, the choosers of the chooser & inquiry framework, they can ascertain information about conceptual patterns (concepts + roles and role restrictions), intended affect, discourse history, etc. needed to make multifunctionally appropriate lexical selections.

I have characterized the lexical resources; but there are implications for the process of lexical choice:

(i) lexical choice is not isolated before grammatical choice; it is merely one aspect of *lexicogrammatical choice;*

(ii) lexical choice proceeds by *gradual approximation;* lexical choice is not a matter of starting by choosing among individual lexical item: it is choice according to the parameters that make up the lexical organization of the language. (Alternatively, if a particular lexical item is given, the system network can be used as a set of redundancy rules by means of backchaining.)

(iii) lexical choice is a reconciliation of simultaneous metafunctional constraints; lexical choice has to be denotationally appropriate (ideational), but it also has to be interpersonally appropriate and textually appropriate.

In general, it is important to recognize that the organization of the lexicogrammatical resources does not commit us to only one way of activating them. It seems quite reasonable to assume that the activation proceeds from less delicate grammatical choices to more delicate lexical ones, as the traversal algorithm in Section II:1.2.1.6 would suggest. However, the systemic network will also allow us to proceed in the other direction, i.e. to activate by backward chaining. If we assume that a particular lexical item has been predetermined for some reason, it is then possible to work backwards and discover what grammatical choices are presupposed by this item.

In the remainder of this section, I will discuss the abstract model in some detail and use it to interpret work on lexical organization and choice for the purpose of text generation. I will start with the internal organization of lexis and then move into its relation to grammar in a unified lexicogrammar.

4.4 The thesaurus model and systemic lexis

One cf the main points of the thesaurus is that it gives an indication of what a functional lexis might look like, i.e., a lexis that is organized as a resource available to the speaker. In other words, Roget's thesaurus is a rough draft of the paradigmatic organization of systemic lexis. Systemic lexis will differ in a number of respects; in particular:

(i) while the thesaurus is a strict taxonomy, the organization of systemic lexis is not;

(ii) while the thesaurus focuses on ideational lexis -- the taxonomic organization of vocabulary -- systemic lexis includes the interpersonal and textual metafunctions as well; and

(iii) while the thesaurus is organized solely according to fields of experience (abstract categories, space, the material world, intellect, volition, and affections), systemic lexis filters these through the categories of lexicogrammar. For instance, part of what Roget lumps together under the heading of 'sensation' would be filtered through the category of (inert) perceptive processes, one of the subtypes of mental processes.

4.4.1 Systemic lexis

In systemic lexis, the paradigmatic organization is represented by means of networks of systems: lexical system networks. The overall organization of the network reflects the thesaurus-like organization of vocabulary.

The terms of lexical systems are essentially like components in *componential analysis*. Feature terms in systems correspond to componential values. For instance, the component ± male can be represented as the system +male / -male (or male / female). It is important to note, however, that all lexical systems are automatically located in a system network, as reflected in their entry conditions. In other words, the system network embodies what is sometimes represented by means of redundancy rules in other frameworks.

Let me give an example from the nominal group to illustrate the system network organization of lexis. The example is adapted from Leech (1974: 121):[12]

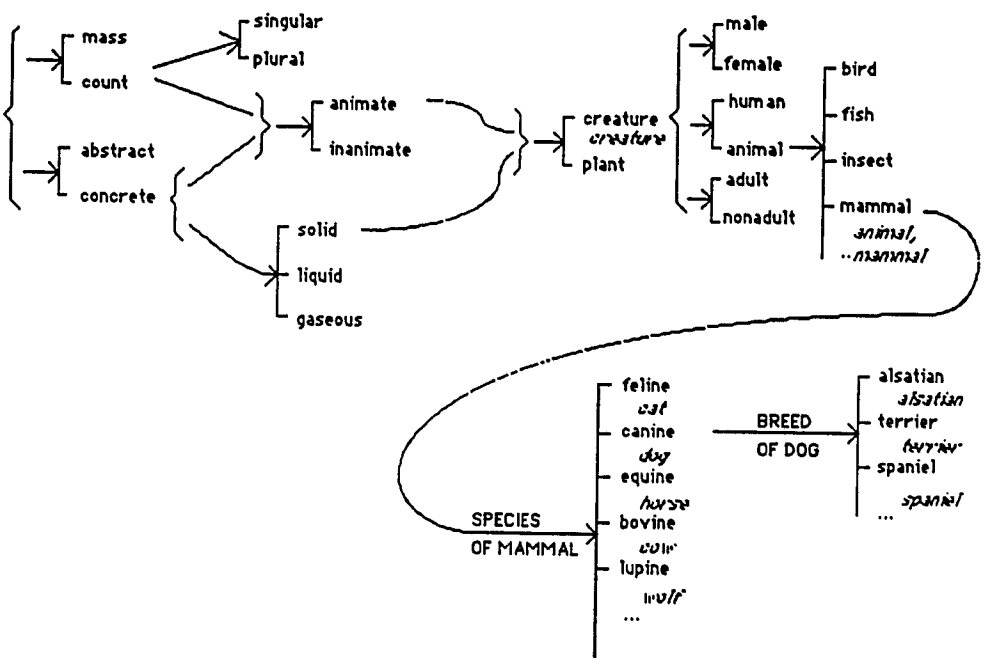


Fig. II:4-7: Lexical organization as system network

One important difference between the thesaurus and systemic lexis is that the latter is not a strict taxonomy. For example, there is a cluster of lexical items such as *fall, drop, descend, climb, mount,* and *rise* which are listed both under

[12] I have left out one system and increased the delicacy of the entry conditions of male / female and adult / nonadult from animate to creature.

'changes in quantity' and 'motion: with reference to direction' in the thesaurus, but this does not reflect the fact that these verbs have something like 'directed change' in common in both uses.

The system network above could not be represented as a strict taxonomic tree of the kind the thesaurus is based on, (i) partly because of entry conditions and (ii) partly because of simultaneous systems.

(i) It has a system with a conjunctive entry condition that could not be represented in a taxonomic tree: animate / inanimate.

(ii) It contains simultaneous systems: animate / inanimate and solid / liquid / gaseous are simultaneous (although it is not quite clear what Leech thinks an animate liquid is); and human / animal is simultaneous with two other systems. Feature combinations from these simultaneous systems are realized by lexical items, as is illustrated in the following old favourite type of example of lexical organization:

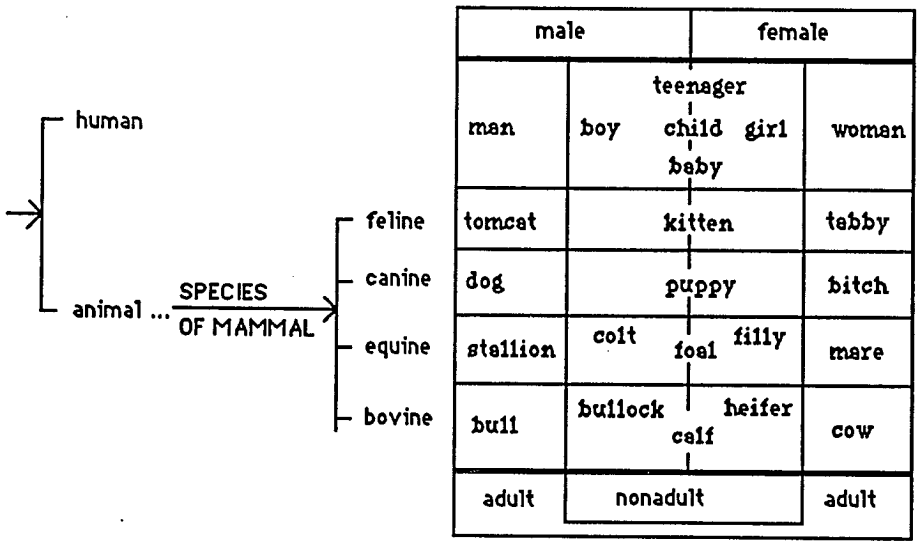


Fig. II:4-8: Realization of lexical features

The example serves to raise a number of points familiar from work on lexical organization. I will mention three, interpreted in systemic terms.

(i) Paradigmatic gaps. If systems occur too early in the system network, the result may be a paradigm with lexical gaps. For instance, the system network can generate the feature combination 'nonadult' & 'male' & 'feline' but there is no lexical item for a male kitten. We can address this issue in various ways.

(a) It is possible to retain the system network as it is and to allow for neutralizations when feature combinations are realized. This is what the table above implies. For instance, the opposition 'male / female' is neutralized in the context of 'feline & nonadult': *kitten.*

(b) We can allow for neutralizations but in addition have the grammar construct wordings to make up for missing lexical items by means of modification: *male kitten,* etc.; cf. Section II:4.5.4 below.

(c) We can change the system network to try to reflect the lexical organization more closely. This will typically mean making systems more delicate in the system network so that their domains of application are narrower. For instance, it might be argued that the lexical systems male / female and adult / nonadult apply only to humans and those higher animals that can be brought into the human sphere of interest by domestication. Furthermore, these systems don't apply equally to all degrees of delicacy; in particular, while they apply to (domesticated) species, they do not apply to breeds at the next degree of delicacy. For instance, there is a word for a young dog, *puppy,* but not for a young Alsatian.

(ii) The decision to continue in delicacy. The normal method of traversing the system network would force us to continue selecting features until the most delicate has been reached on a particular path. There are problems with the system network sketched above in that it is not set up to allow for the choice not to continue in delicacy. For instance, if the feature 'creature' is chosen, there is no way stopping at that degree of delicacy, even though the lexical item *creature* has been fully specified and could be used. The same is true of subsequent terms such as 'mammal' and 'canine'.

Now, while any given taxonomy is finite in delicacy, we can think of the taxonomic principle as being the one embodied in a logical set of systems,

where we have the choice between stopping and going on to make further distinctions:

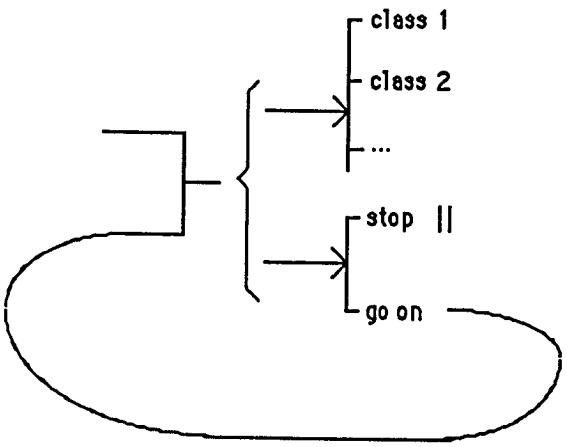


Fig. II:4-9: Taxonomy on logical principle

Here we make class distinctions and at the same time we can choose between stopping and going on to differentiate subclasses. The lexical systems cannot be organized in terms of logical recursion since a taxonomy does not extend indefinitely and the classes at any given step in delicacy are quite different. But we can use the principle of incorporating a choice between stopping and going on. We do this in either of two ways. (a) We can locate the system 'stop / go on' as a more delicate choice after each term representing a class. This approach is exemplified for the terms 'mammal' and 'canine' below.

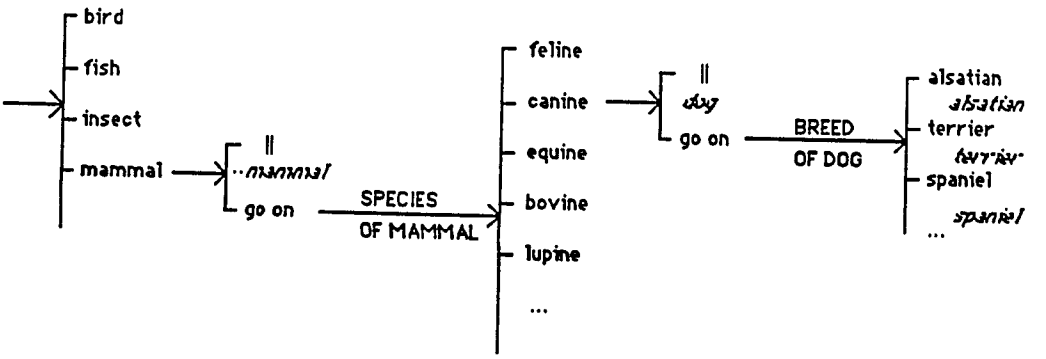


Fig. II:4-10: Selecting delicacy, alternative (a)

If the term 'mammal' has been chosen, we enter the next system and choose between specifying the class more delicately ('go on') and stopping at the current degree of delicacy.

(b) The approach above is straightforward, but it requires a 'stop / go on' system for each term that may lead to further differentiation and it does not reflect the possible commonality of these various instances of the 'stop / go on' system. We can address this inadequacy by incorporating the system 'stop / go on' as simultaneous with systems specifying classes. For instance, we can set it up as simultaneous with SPECIES OF MAMMAL and with BREED OF DOG:

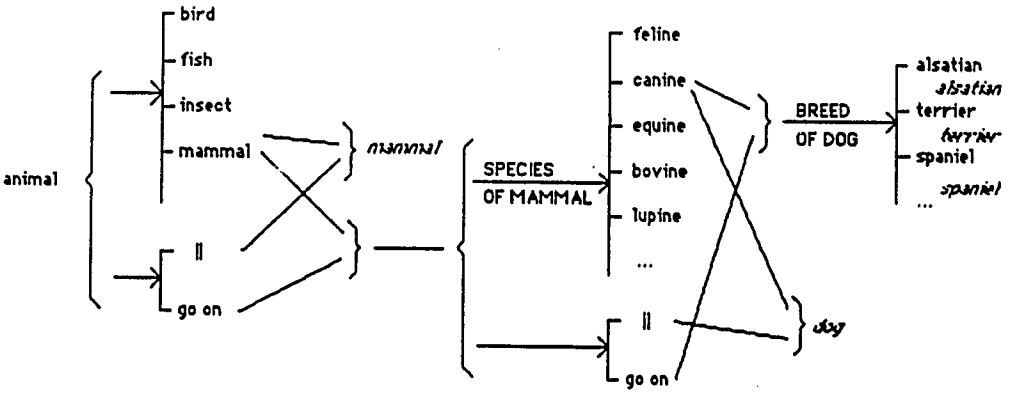


Fig. II:4-11: Selecting delicacy, alternative (b)

This approach presupposes that the choice between stopping and going on is the same for each genus of animal and each species. And to the extent that it is, the approach is justified even though it leads to a fair bit of intermediate wiring.

There is a third type of approach to the representation of the choice between further differentiation and stopping in the classification.

(c) Option of stopping as new type of option. We can simply represent the approach sketched in (a) by designing a special privative system (cf. Section II:1.2.1 above) whose only function is to allow the traversal of the system network to stop in case the expressive needs have already been satisfied. This system always means roughly 'if there is good reason to proceed in delicacy, do so; otherwise, stop'. I will represent it simply as a break in the wiring leading to

the system dependent on a term -- symbolically --||--. So here is a third version of our canine example:

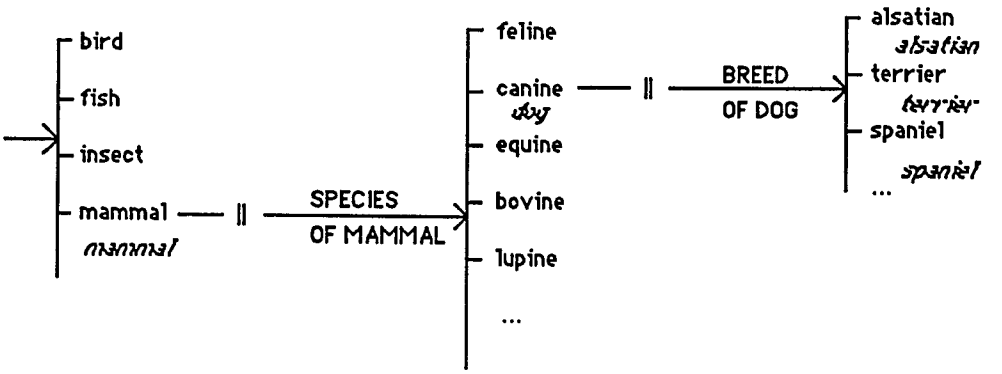


Fig. II:4-12: Selecting delicacy, approach (c)

The delicacy issues just touched on are, in principle, general to all of lexis. At the same time, however, they are more central to the lexis of nouns than to other parts of lexis: nouns are taxonomically more articulated than other word classes. Let me now move to the third issue raised by the model of the lexical system network.

(iii) Registerial differences: folk taxonomies vs. scientific taxonomies, etc.. The example taken from Leech also raises the question of register and lexical organization. There are many considerations here, for example tenor: formality, familiarity, etc. and field: particular field of discourse and degree of technicality. Here the issue of the difference between folk taxonomies and technical ones; i.e., between common sense knowledge and educational knowledge have to be considered: to what extent can they be integrated into one lexis; do they

constitute different, register-specific systems of lexis? Whales have probably outlived their illustrative value -- are they fish or mammals? The taxonomy reflected in Leech's network is technically appropriate but it can be argued that it should also reflect a general distinction between 'higher animal' and 'lower animal'. Such a distinction emerges from a consideration of covert gender classes in English, as Quirk et al (1985: 314) indicate.

The answers to questions like these will almost certainly depend on the purpose of the description and they are probably fairly easy to resolve in relation to today's and tomorrow's simple text generators. The considerations are, in principle, similar to those discussed in connection with grammatical coverage in Section II:2; but, since lexis is more specific than grammar, it is more sensitive to register variation.

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As the example of a systemic account has shown, lexis is organized as a system network of lexical alternatives; it can be seen as a systemic version of componential analysis, as it has been used in linguistics (e.g., Bendix, 1966; Lehrer, 1967) and anthropological linguistics (e.g. Frake, 196). The approach to lexis will have the same advantages as it does within grammar: it decomposes the task of lexical choice into a number of simple steps and the choice of the appropriate item becomes a matter of gradual approximation.

Before exploring the relationship between lexis and grammar as a further aspect of lexical organization, I will consider the use of lexical system networks

in text generation as exemplified in Goldman's (1974) work.

4.4.2 Systemic lexis and Goldman's discrimination nets

Halliday has suggested (p.c.) that the chooser and inquiry approach used in Nigel (Section II:1.2.1.5 and Chapter III) could be extended to control a lexical network in addition to the grammatical part of the system network. In fact, Goldman's (1974) BABEL generator can be interpreted in the terms Halliday suggests, as having a lexical system networks with lexical systems equipped with choosers capable of obtaining the information needed to make appropriate lexical choices. In BABEL, the equivalent of the system network is the so-called discrimination net (used in AI) and the equivalent of an inquiry is a so-called defining characteristic.[13] Goldman's use of discrimination nets set up to handle lexical choice illustrates the value of the systemic organization of lexis in text generation.

In generation, BABEL is presented with a conceptual structure. As BABEL traverses the discrimination net, it checks this conceptual structure against defining characteristics each time it comes to a node in the net. The outcome is the selection of a word sense. Goldman developed fifteen discrimination nets for BABEL. I have adapted one of them freely and present it as a system network with informal inquiries; it covers some processes of ingesting: see the figure below.[14]

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[13] Goldman focussed on the selection of "word senses", which corresponds to the ideational part of a systemic lexis.

[14] My purpose is not to reject or accept Goldman's description but to show how his account fits into the approach sketched here.

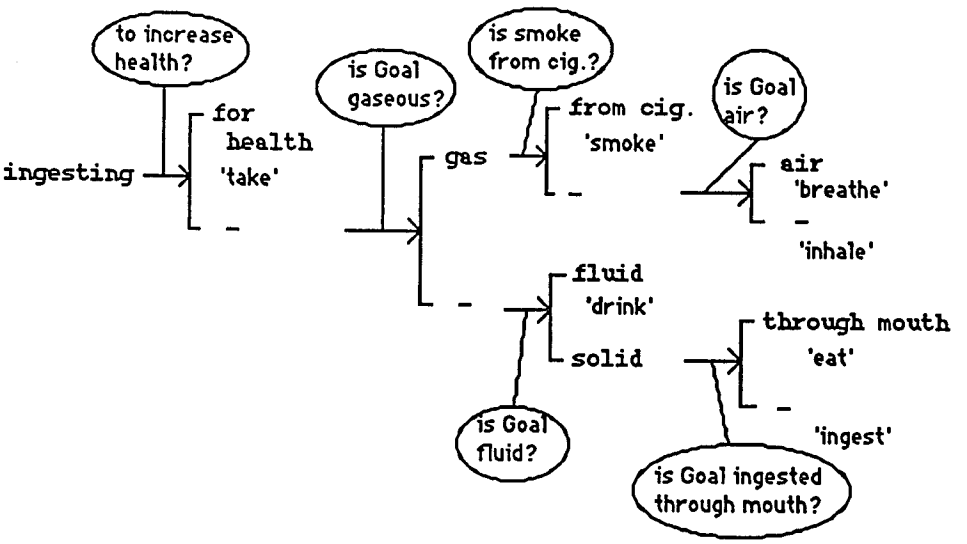


Fig. II:4-13: Lexical system network adapted from Goldman (1974)

The discriminations are based on the *purpose* for ingesting and the nature of the goal of ingesting. For example, the first inquiry ascertains whether the actor undertakes the ingesting to increase his or her health; if he or she does, the feature for health is chosen and the lexical item is *take* (as in *take cough medicine*).

Goldman's work shows the feasibility and value of lexical system networks in a computational system. Moreover, given an approach such as his, it is possible to interface the lexical network with different kinds of knowledge representations as long as the appropriate distinctions are made. He uses Schank's conceptual dependency representation but it is also possible to use KL-ONE or another type of representation. The point of conceptual dependency representations of

the type Goldman used is that they operate with combinations of primitive concepts and may not include concepts corresponding to the word senses represented in the discrimination network. Thus, for example, given a conceptual representation 'henry + ingest + beer',[15] the lexical network will allow us to select 'drink' for 'ingest', since 'beer' is liquid.

Goldman does not relate the lexical discrimination nets to the grammar in BABEL in the way grammar and lexis are related in systemic theory, but it is easy to see how the network above might be integrated with a grammatical one: see Section II:4.5.1 below.

4.4.3 The heterogeneity of the lexical entry

After this brief sketch of the thesaurus-like organization of systemic lexis, we can return to the dictionary and ask what happens to its building blocks, the dictionary entries. The entry into the dictionary organization is the lexical entry. Each lexical entry is a 'hub' from which other entries can be accessed.

The most sophisticated and elaborated notion of what constitutes a lexical entry is probably the one developed for the Explanatory Combinatorial Dictionary component of the Meaning-Text Model by Melchuk, Zholkovsky, and others (e.g., Apresyan, Melchuk & Zholkovsky, 1970; Melchuk, 1982; 1986). A lexical entry in an Explanatory Combinatorial Dictionary consists of three major entries (Melchuk, 1986: 57):

[15] The condeptual dependency representation is more complex than this example, of course; but the point is that it uses fairly primitive concepts like 'ingest' which are then represented by lexical items such as *eat* and *drink* in the context of a particular type of goal.

semantic zone;

syntactic zone; and

lexical cooccurrence zone

For present purposes, the most interesting aspect of the lexical entry is the lexical cooccurrence zone. Melchuk (op cit., p. 60) notes that it "embodies the major novelty proposed in an [Explanatory Combinatorial Dictionary]: namely, exhaustive and systematic description of restricted lexical cooccurrence of the entry lexeme." Lexical cooccurrencies are represented by means of ***lexical functions,*** characterized as follows (p. 60):

> A lexical function (henceforth, LF) **f** is, like any mathematical function, a dependency that associates with a given "quantity" - its argument - a variable "quantity" - its value, the latter being controlled by the former. More precisely, an LF **f** associates with a lexical unit *W* (a word or a phrase) a set W_i of (more or less synonymous) lexical units that express - contingent of W - a specific idea (such as 'very', 'begin', 'implement') represented by **f**.

For instance, there is a lexical function Magn (roughly 'very'), which, when applied to *grateful* yields *deeply* and when applied to *sophisticated* yields *highly.*

The notion of lexical cooccurrence is not new with the Meaning-Text Model. It is in many respects similar to Firth's notion of collocation. Further, lexical functions are foreshadowed in Bishop Wilkins' (1668) use of transcendental particles. These particles are combined with the root words of his taxonomic tables to yield derived words. For instance, corresponding to the lexical function

Son (meaning the typical sound produced by what it is applied to), Wilkins has the transcendental particle voice; Son (*dog*) yields *bark* and voice (*lion*) yields *roar.*

However, the most extensive account of how a lexical item may be related to others is undoubtedly the list of lexical functions identified with the Meaning-Text Model. Now, their collection of lexical functions is fairly heterogeneous, I think. This heterogeneity should not be surprising since the lexical entry itself is a way of compiling information that may be dispersed in a system-based account of lexical organization. The lexical functions correspond to different aspects of a systemic lexis. Some of the relations are inherent in the system network itself, while other relations require different treatments.

The lexical functions fall into the following general classes.

(i) **Taxonomic:** lexical functions referring to the taxonomic organization of lexis. The function Gener is reflected in the delicacy ordering of the systems of the system network. For instance, Gener (green) = colour simply means that 'green' is a more delicate specification of colour than is 'colour' itself. Other lexical functions in this group are concerned with the type of opposition represented by a lexical system; these functions include the general contrasts of synonymy and antonymy as well as more specific feature contrasts such as Magn 'very' (as in Magn (frighten) = terrify) and Perm 'permit, make possible' (as in Perm (fall) = drop). The fact that these have been identified as lexical functions indicates that they correspond to recurrent types of lexical systems. In other words, they can be taken as part of a typology of lexical systems.

(ii) Non-taxonomic lexical functions, not referring directly to the taxonomic organization. There are three groups.

(ii.i) **Collocationally condition choice:** lexical functions relate two lexical items, one of which constitutes a conditioning environment for the selection of the other to express one of a set of features corresponding to lexical functions such as Son, Minus, Plus, Incep, Degrad, Prepar, and Bon. For instance, Prepar (table) is 'lay'; i.e. 'preparation + table' is expressed as *lay* (or *set*) *[the] table.* These lexical functions reflect the fact that lexical items are not chosen in isolation, but in pairings that are identifiable in terms of the categories of the grammar. They are important in generation and I will return to them in Section II:4.5 (see II:4.5.1 (iii) for a general discussion).

(ii.ii) **Inherent property of participant:** a small group of lexical functions identify the inherent property of an entity participating in a particular process. Thus, 'A' identifies the generic attribute of a participant. For instance, the generic attribute of the Senser of the mental process of knowing is 'aware' and that of the Phenomenon is 'known / familiar'. 'Able' identifies the generic definition of a participant. For instance, the Goal of the material process of burning is 'combustible'. Finally, 'Qual' identifies a quality of a participant; the 'Qual' of the Phenomenon of 'understand' is 'obvious'.

(ii.iii) **Derivational:** lexical functions in this group relate the members of the scatter of a lexical item. There is one function for each major word class (noun, adjective, adverb, and verb). For instance, A[djective] applied to 'sun' yields 'solar'.

As this brief survey shows, lexical functions are quite diverse. Their commonality lies in the compilation of a lexical entry of a lexical item that should make it possible to access different kinds of lexical information about the lexical item.

4.5 Lexicogrammar (ideational)

I have discussed the internal organization of lexis and will now turn to its relation to grammar.

4.5.1 Lexis as most delicate grammar

If we take the thesaurus as the rough draft of systemic lexis, we can explore the hypothesis that lexis is most delicate grammar; that lexis and grammar are related along the dimension of delicacy as specific to general. Halliday (1961) called this possibility the *grammarian's dream;* in a sense, it is the inverse of the lexicographer's dream that grammar is most general lexis. Halliday (1974/78: 43) states the position as follows.

> The lexical system is not something that is fitted in afterwards to a set of slots defined by the grammar. The lexicon -- if I may go back to a definition I used many years ago -- is simply the most delicate grammar. In other words, there is only one network of lexicogrammatical options. And as these become more and more specific, the tend more and more to be realized by the choice of a lexical item rather than by the choice of a grammatical structure. But it is all part of a single grammatical system.

Trier's (1931) work highlights the organization of lexis into fields and the thesaurus illustrates this clustering into fields. The unification of lexis and grammar implies that grammar is also organized into fields represented by system networks; the difference is only one of degree: *'grammatical fields'* are more general than *'lexical fields'*. For instance, the four general process types constitute general grammatical fields -- the fields of doing, sensing, saying, and being & having, whereas culinary metamorphosis constitutes a lexical one -- the field of boiling, baking, and frying.

Hasan (1984/7) demonstrates the feasibility of the grammarian's dream for the lexical field of disposal -- processes of gathering, collecting, scattering, dividing, and so on; I will return to these below. She writes in her conclusion:

> Lack of space does not permit a detailed discussion of the implications of turning the whole of linguistic form into grammar, but if the account of the nine lexical items presented above has appeared valid, then it certainly upholds the systemic functional view of an uninterrupted continuity between grammar and lexis. It rejects the approach wherein the bricks of lexis are joined together by the mortar of grammar. The notion of the lexicon as an inventory of items, each having its own meaning in itself, stands refuted, and the insights of Saussure 1916, Firth 1935, Hjelmslev 1961, Whorf 1956 and Halliday 1961 are confirmed.

Goldman's discrimination network of processes of ingesting presented above is an example of the taxonomic organization of one lexical field. We can now explore how it relates to the grammatical fields of doing, saying, and so on. Ingesting (as conceived of in Goldman's discrimination network) is one type of doing. Like other doings, processes of ingesting involve an Actor and a Goal, as in

He drank the hot coffee in a great hurry

Ac Proc Goal

What he did with the coffee was drink it in a great hurry

Ac Proc Goal Proc Goal

These patterns follow automatically if the lexical system network of ingesting is integrated with the grammatical systemic network of transitivity, as in the diagram below.

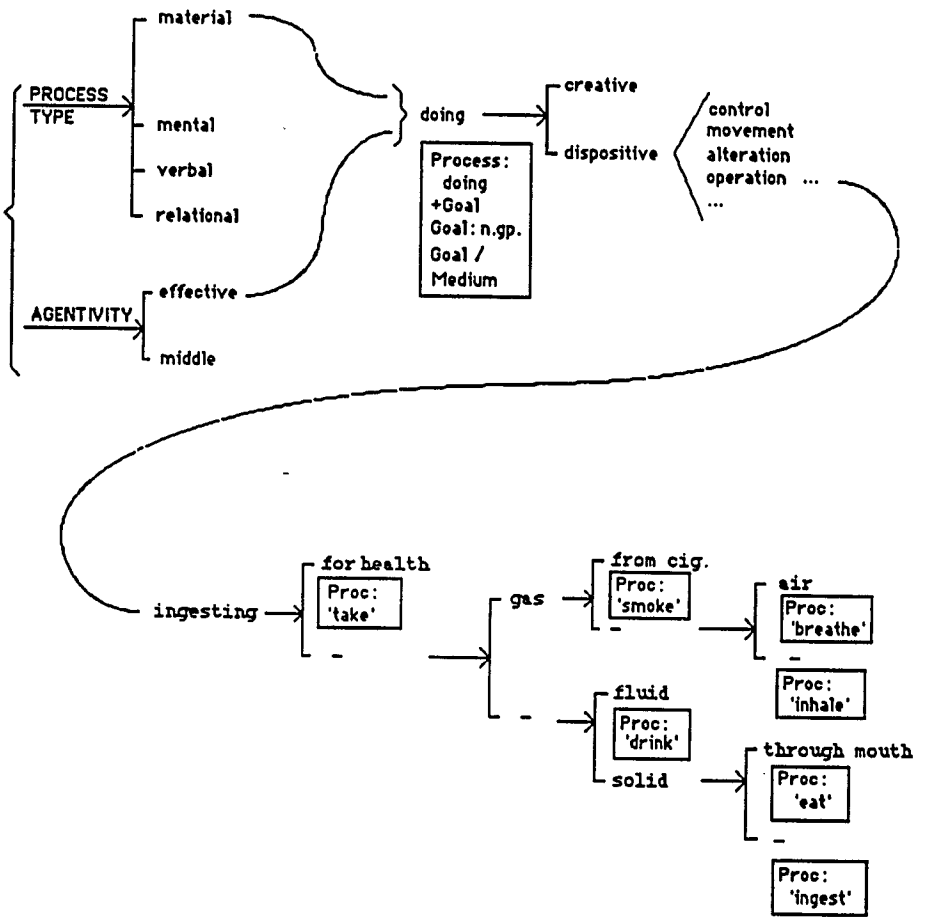


Fig. II:4-14: Processes of ingesting integrated with transitivity

There are a number of immediate subtypes of dispositive doing -- motions, alterations, operations, and so on. This area of the grammar has to be worked

out in more detail; for present purposes, we can just assume that processes of ingesting are a subtype of operations, with a number of intermediate steps in delicacy. They share with all types of doing the possibility of having a Goal as well as an Actor; but unlike processes of transfer (giving, donating, sending, and so on) they cannot have a Recipient.

More examples of lexical extensions of the various process types within the grammar of transitivity will be given presently in Section II.4.5.3.1. First, however, I will say something about the consequences of looking at lexis through grammar.

4.5.2 Lexical organization seen through grammar

The purpose of this section is to take a bird's eye view of English to see how far the systemic view that lexis is organized as an extension in delicacy of the grammatical system network can take us. The section is thus mainly descriptive.

4.5.2.1 General considerations

I will focus on the principles of lexical organization in general and on lexical organization that involves collocational conditioning.

(i) The continuation of grammar into lexis

When lexis is treated as most delicate grammar, there is, of course, no point at which we can no longer make grammatical statements. Each lexical item can, in principle, be given its own grammatical characteristics; but it is more likely in general that these will apply to lexicogrammatical classes rather than to individual items. Thus we should not be surprised to find options and realizations specific to processes of loading & stuffing, swarming & teeming, and so on.

For instance, there are two basic types of verbal process. One represents a speech functional value (telling, saying, asking, enquiring, promising, threatening, ordering, commanding, etc.). The other subclass focusses on the behavioural aspect of verbal processing -- talking, speaking, chatting, chattering, prattling, gossiping, etc.. These are like the speech functional verbal processes in that the verbal clause can have an Addressee, a specification of the code of verbalization, and a specification of the subject matter; but they are unlike them in that they cannot serve to project another clause:

	verbal behavioural	speech functional
address	They talked <u>to me</u>	They told <u>me</u>
code	They talked <u>French</u> to me	They told me <u>in French</u>
matter	They talked to me about the problem	They told me about the problem
projection		They told me that you had left

The function Code is usually marked by the preposition *in.* For the verbal behaviourals that are neutral with respect to the manner of behaviour (i.e., speaking and talking as opposed to chatting, prattling, and so on), there is a further option for the representation of Code: if it follows immediately after Process, the preposition is optional:

```
They chatted in French to me
They chatted to me in French
They spoke (in) French to me
They spoke to me in French
```

These are just a few simple examples of the grammatical characteristics of small lexical classes. Others could be given from the field of verbal processes, such as offering as opposed to commanding (Sayer giving, i.e. offering, so it is the presumed subject of the reported clause: *they promised me* || *to leave / that they would leave;* vs. Sayer demanding of Addressee, so the latter is the presumed subject of the reported clause: *they commanded me* || *to leave* 'that I leave'), or other process types. But the general point is that systems with structural consequences may be of a degree of delicacy we would call lexical, which is unproblematic in a unified lexicogrammar.

(ii) Principles of lexical organization

As we extend the grammar in delicacy towards lexis, we will approach the organization of lexis through the categories of grammar. For example, the lexical organization of verbs is seen through the categories of the clause, since

verbs stand in a realizational relation to the Process of the transitivity structure of the clause.[16] So, if we approach the ideational organization of this part of lexis, it will be through the categories of transitivity. This means, stated very generally, that the categories are process + participants + circumstances:

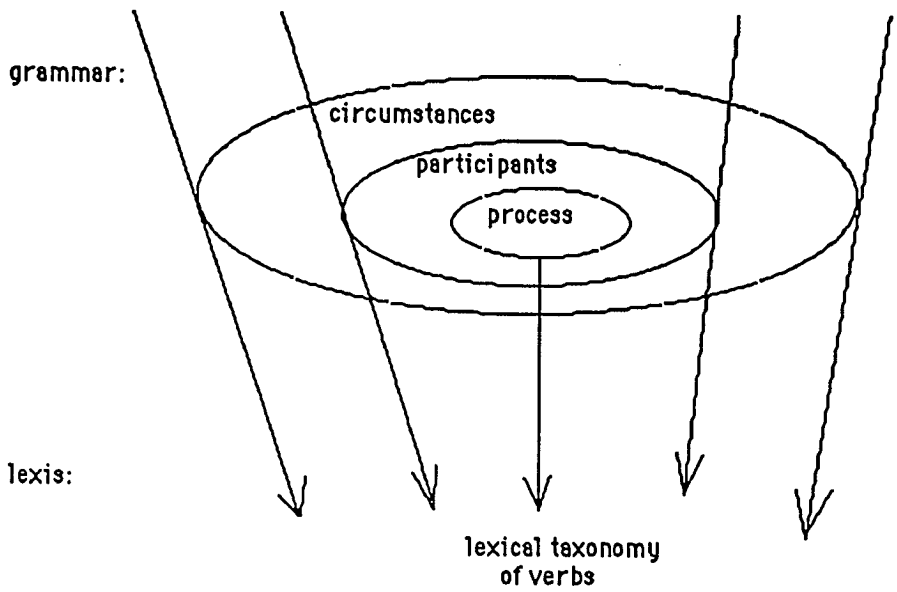


Fig. II:4-15: Lexis through the categories of grammar

The distinction between participant and circumstance is a cline. Participants are more central to the process than circumstances and circumstances may be 'inner', more closely related to the process, or 'outer' (cf. Halliday, 1970). This cline between participants and circumstances has been represented in various frameworks, e.g. as a distinction between marginal and nuclear in tagmemic

[16] There is also the intermediate step of the verbal group, with the categories of the hypotactic verbal group complex -- phase, conation, causation, and so on. We will see below how phase is reflected in the organization of processes of 'being'.

work (e.g., Pike & Pike, 19), between satellite and nuclear arguments in Dik's (1978) Functional Grammar, and between periphery and core in Foley & Van Valin (1984). It is essentially the central participants that underlie the organization into the four basic process types of English -- material, mental, verbal, and relational.

When we look at the lexical extension of the basic process types, we find that more delicate distinctions among process types are also typically based on the nature of their participants and/or circumstances.[17] For example, processes of motion (cf. Talmy, 1986) are organized in terms of the place of the movement (in water: 'swim', on water: 'float', etc.), the direction of the movement (downwards: 'sink', 'fall', 'descend'; upwards: 'rise', 'ascend'; towards speaker: 'come'; away from speaker: 'leave'; etc.), the manner of the performance of the movement, either means (by means of legs: 'run', 'walk', 'limp', 'trot', etc.; by means of plane: 'fly'; etc.) or quality (manner in a narrower sense; in a fast manner, moving legs in a particular way: 'run'; with a limp: 'limp'; etc.), and the purpose (to escape: 'flee'; for pleasure: 'stroll'; for exercise: 'jog'; to catch: 'hunt', etc.).

Further examples are given in the table below. The various parameters listed combine to define sets of contrasting processes; a particular process is typically defined in terms of several parameters simultaneously. What parameters are relevant in defining a particular process will depend on what semantic field it belongs to (motion, transaction, acquisition, perception, possession, and so on). It would lead beyond the scope of chapter to explore the principles the various taxonomies are based on, but it may be useful to list some examples of

[17] If a syntagmically-based model is used, participant and circumstantial parameters in the organization of lexis are likely to be treated as if they were constituents that are incorporated into a verb. For instance, *limp* would be 'walk' + (incorporated) Manner: 'with a limp'.

distinctions among verbs in English; for relevant discussions, see e.g. Leisi (1952), Talmy (e.g. 1986), and Hasan (1985/7).

role type		example of distinction general, misc.:	material: motion	mental: perception
participant		material / mental / verbal / relational more specific, e.g.: accumulate/collect/gather/ amass/ ...; eat [solid]/drink [liquid]	canter [horse]/waddle [duck]	
attribute, result		break [broken]/dent [dented] /dissolve [dissolved]/ wound [wounded]/ kill [dead]/...	sit (down) / lie (down)	
circumstance	location: place		fly [in gas]/swim [in liquid]/ float [on liquid]/walk [on ground]/...	
	direction		come [here]/go [away]; arrive/leave; fall [down]/rise [up]; ascend/descend/climb	
	duration	stay [temporary]/ live [permanent]		
	manner: means	stab [with a knife]/strangle [with a rope]/hang/shoot/...	fly [by plane]/sail [by ship] /drive/ride/...	see [by means of eyes]/ hear [by means of ears]/ smell ...;
	degree	touch [light]/hit [hard]/tap/...		
	quality		limp [with a limp]/run [fast]/ stroll [walk leisurely]/ walk/trot /...	hear / overhear
	cause: purpose	state/ask/command/...	flee [to escape]/run;	
	reason	tremble [with fear]/quiver [from cold]/shudder/...		

Fig. II:4-16: Examples of process distinctions

Some of the categories exemplified above also emerge clearly when we look at noun to verb derivation. In particular, there is an orientation either towards the outcome or result of the performance of a process or towards the performance itself.

role type		noun	verb derived	
participant		carpet peel	carpet [give to] peel [deprive of]	result
attribute, result		(pulver (black cash cripple	pulverize) [make -] blacken) cash cripple	result
circum-stance	location: place	(house	house)	result
	direction	down(adv) shelf bottle	down (a plane) shelve [put on shelf] bottle [put into bottle]	result
	manner: means	knife mouth eye ship bicyle	knife mouth eye ship [send by] bicycle [go by]	performance
	degree			performance
	quality	mother baby boss lord	mother [treat in the way of a mother] baby boss lord (it)	performance
	role	referee	referee [act -]	performance
	cause: purpose reason			
	duration			

The distinctions in the lexical organization of verbs are based on differences in the typical fillers of the participant or circumstance roles of the processes the verbs realize. In this respect, processes differ from other semantic classes such as things. For example, things of the type 'natural kinds' are classified according to attributes such as animacy, sex, maturity, and size rather than according to participants and circumstances. (Artefacts are obviously more sensitive to purpose in their taxonomic organization.)

(iii) Conditioned lexical choices: collocation

Once grammar has been extended into lexicogrammar, we can address the question I raised earlier of how to handle collocationally conditioned lexical choices in terms of the grammar. In other words, we can explore a grammar-based approach to collocationally conditioned lexical choice, such as *drop / fall + temperature* to indicate a decrease in temperature.

If we take a grammar-based approach to lexical choice, lexical selection takes place in a grammatically determined environment and can affect more than one lexical item at a time. In principle, any of the transitivity functions of the clause -- any participant or circumstance -- could be paired off with the process in a collocational conditioning. However, it seems to be the case that only one of the participants most closely related with the process, i.e., either Medium or Range, or an *inner* circumstance such as Manner is involved. Participants less tightly bonded with the process and more peripheral circumstances are not involved:

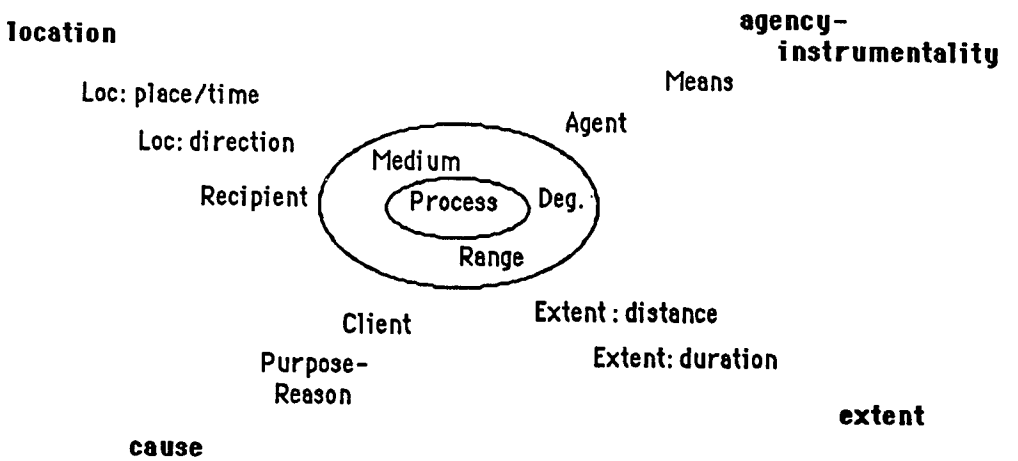


Fig. II:4-17: Centrality and collocational conditioning

Examples are tabulated below. (Similar observations can be made with respect to the nominal group -- only a subset of the functions of the nominal group are involved in collocational pairings; see Section II:4.5.3.2 below.)

Process	Medium	Range	Degree	Location Extent Cause Agent ...
twinkle roar shell	star lion pea			
turn take give		sour shower smile		
love know agree			deeply completely entirely	

Fig. II:4-18: Examples of collocational conditionings

The picture that emerges makes good sense from the point of view of the ideational metafunction. The task is to represent a process. In the limiting case, participation and the occurrence of the process are not represented as separate components: *it's raining, it's cooling off;* but the process is typically represented by means of some combination such as *twinkle + star, shine + moon, drop + temperature, blow + wind,* and *fall + rain.* That is, a composite phenomenon such as a process (cf. Section IV:2), is represented in a composite way and this is reflected in the partial interdependence of *twinkle + star,* and so on. Lexical choice does not proceed item by item, according to the way they are listed in the dictionary.

A collocational pair such as *drop + temperature* is, in a sense, intermediate between a complete union such as *cool off* and fairly independent selections as in *decrease + temperature.*

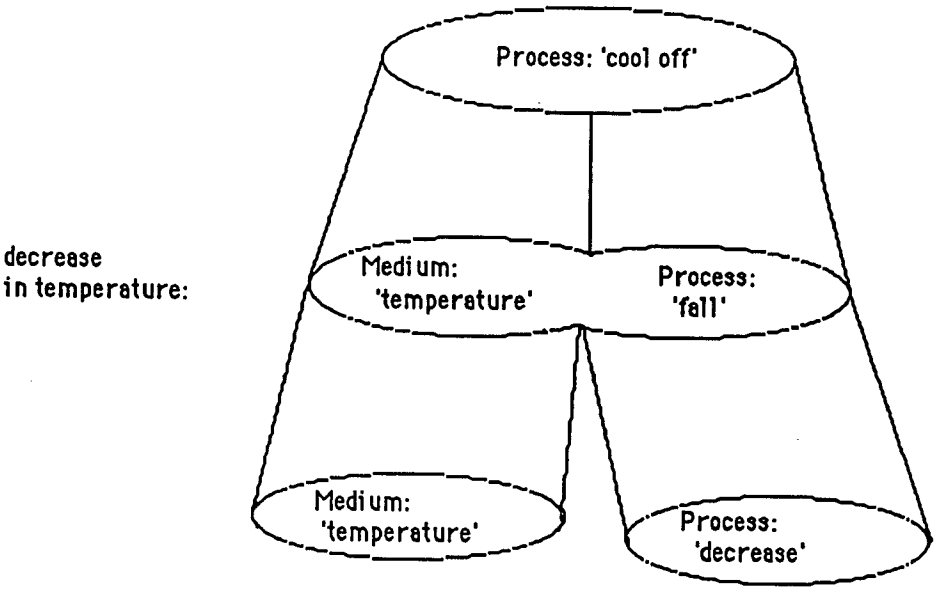


Fig. II:4-19: Degrees of 'compositionality' / collocational dependence

That is, while most measurable things can decrease, only those for which there is a metaphor of a vertical scalar dimension can drop or fall.

We have seen before how general grammatical distinctions are reflected in restrictions on combinations of e.g. Process + Medium. Increasing delicacy leads to increasing restrictions on combinations such as Process + Medium and restrictions on combinations such as *drop + temperature, wreak + havoc, neigh + horse,*and *bark + dog* are only the limiting cases in delicacy. The model of lexis as most general grammar allows us to move from general grammatical distinctions to specific lexical ones. For example:

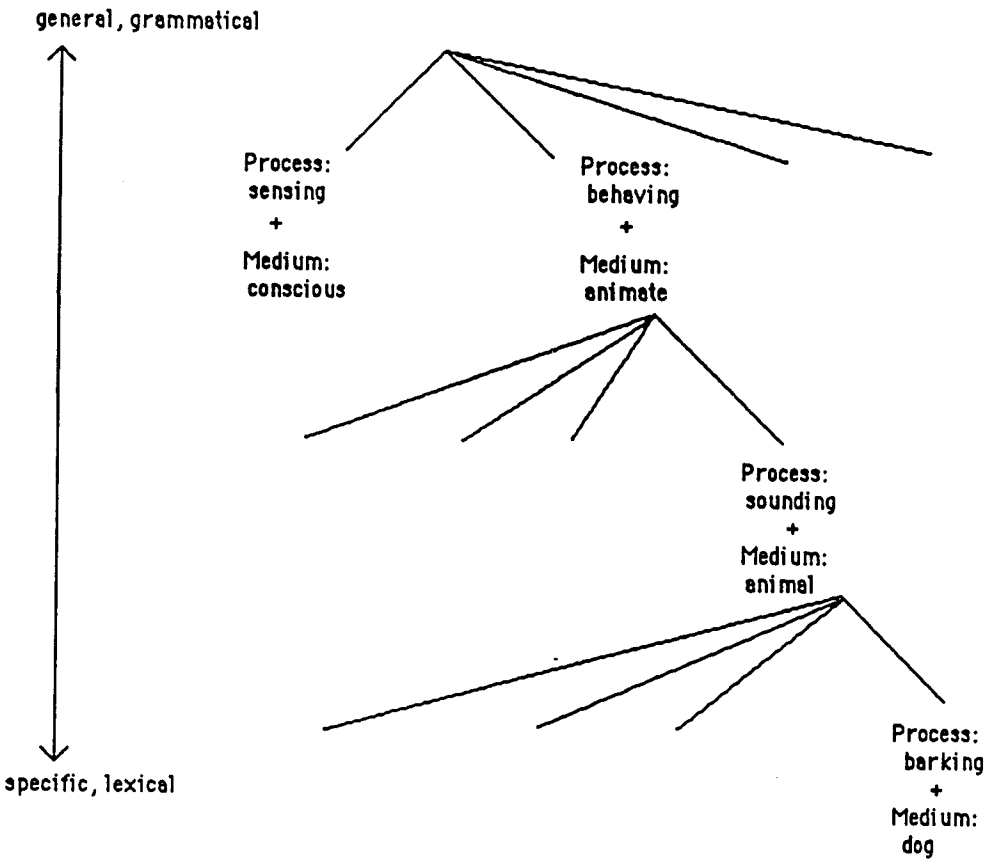


Fig. II:4-20: Delicacy in restrictions on Medium + Process

The collocational restrictions on Process + Medium can be stated in terms of specific lexical items, but they can also be stated in terms of *lexical classes* realizing the functions. The same is true of the combinations Process + Range and Process + Manner. Let me illustrate the point.

Process + Medium. For example, possible representations of the combination of 'change + temperature' include clauses where the Medium is realized by a nominal group whose Head is *temperature,* the Process can be *drop, fall* (decrease) or *rise* (increase) in addition to the more general *decrease* vs. *increase.* In addition to 'temperature', we also find 'weight', 'prices', etc.. More generally, there is a cluster of *'change + object measured against scale'.* The boundaries may be fluid, but the generalization is that there is an underlying lexical metaphor which treats the scale as if it were the vertical axis in a space in which the object can move up and down. For example:

Medium	Process
temperature *pressure* *humidity* *weight* *prices* *interest* *employment* *exports* *level*	*increase* *rise* *go up* *decrease* *fall* *drop* *go down* *plummet*

Fig. II:4-21: Quantitative change as vertical movement

Relative to the lexical metaphor, the strategies for expressing increase and decrease are motivated.

If we look at examples such as those just given from the point of view of lexical entries in the dictionary, it may seem natural to say that we have pairings such as *fall + temperature,* recorded by means of one of the lexical functions identified by Melchuk et al.. However, if we take lexicogrammar as the starting point, it is important to note that classes of participants and processes are involved rather than just individual items.

Process + Range. Pairs of Process + Range are either of a relational type or of a material and verbal type. For instance, the relational type is ascriptive and intensive, of the inchoative subtype. It includes examples such as *fall + victim, come + true, turn + traitor, turn + sour / bad, go + crazy / mad / nuts / bananas, go + white / red / yellow,* and *fall + ill / sick / lame.* As the examples illustrate, the verbs of becoming are often applicable to small lexical sets.

Process + Manner: degree. Restrictions on combinations of Process + Manner typically involve a mental process, cognitive or reactive, and a manner of degree: *believe / forget / understand + completely; love / hate / respect + deeply.*

To sum up, collocational pairings often involve classes of lexical items rather than individual items alone and these classes may be recognizable as features in the systems of the grammar of transitivity or as natural further differentiations. For example, lexical functions involving restrictions on a specification of degree (the Manner: degree) often apply to cognitive or reactive mental processes; *deeply* goes with reactive ones.

Restrictions of this kind can often be related to a ***lexical metaphor.*** Whorf (1939) notes that durations, intensities, and tendencies are typically expressed metaphorically by means of "spatial extension" in Standard Average European languages (cf. also Lakoff & Johnson, 1980). *Deeply* is an example of this as are expressions of change on the stock market involving a material Process of vertical motion + Medium; prices, leaders, indicators, etc. rise, climb, drop, and fall. There is an important tie between lexical metaphor and collocational restrictions of the kind just illustrated.

As I will illustrate in the next subsection, collocationally conditioned lexical choices correspond to a small set of pairs of experiential functions, mainly (i) in the clause, (ii) the prepositional phrase, and (iii) in the nominal group.

4.5.3 Descriptive overview

I have discussed the general principles of lexical organization and will now turn to an illustrative descriptive overview from the point of view and the clause, the prepositional phrase, and the nominal group. I will focus on the systemic continuity of lexis and grammar and on collocationally conditioned lexical choices.

4.5.3.1 The clause

We can start with the four basic process types in English -- material processes (actions, activities, events, etc.), mental processes (processes of consciousness, involving a Senser [Experiencer]), verbal processes (processes of symbolization, such as saying, telling, showing, and indicating), and relational processes (processes of being & having). These four types -- or 'fields' -- are grammatically motivated; they generate different transitivity patterns. The contrast material / mental / verbal / relational is the first system in the transitivity part of the clause system network and each term leads to further systems.

4.5.3.1.1 Mental

The basic options for mental processes are perceptive / cognitive / reactive:

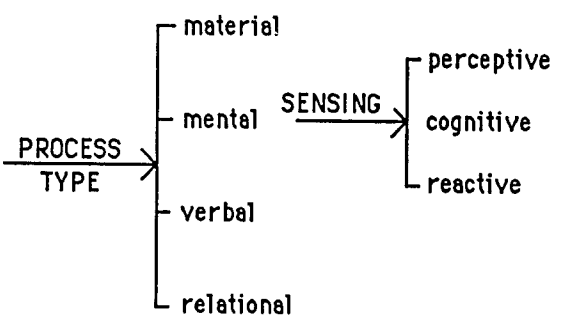


Fig. II:4-22: Basic mental options

I will use examples from perceptive and reactive mental processes.

Perceptive. The feature 'perceptive' is the entry condition to two systems, (i) phenomenal / macrophenomenal / metaphenomenal; and (ii) general / specific. They are diagrammed below.[18]

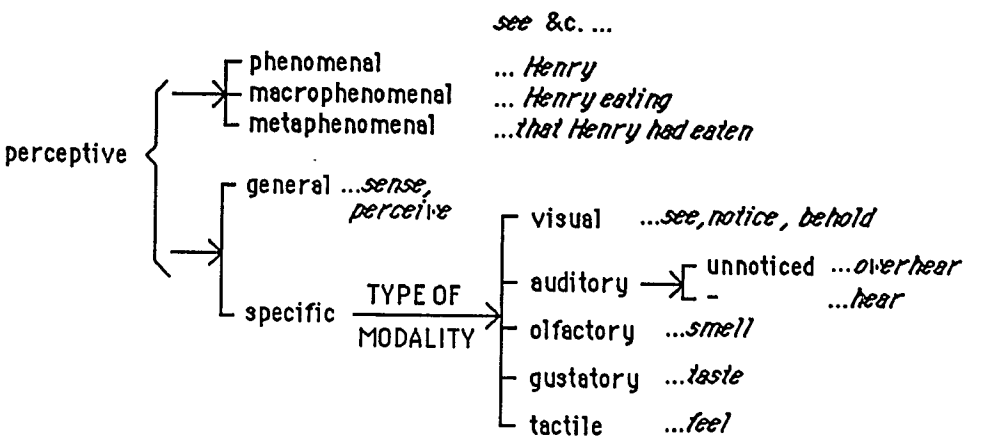


Fig. II:4-23: The lexicogrammar of inert perception

The system phenomenal / macrophenomenal / metaphenomenal deals with the nature of the Phenomenon, which is realized by a nominal group or a clause. It differentiates different kinds of phenomena of perception; for example:

phenomenal (simple phenomenon realized by a nominal group):

We saw <u>Henry</u>

[18] The description is only intended as an illustration, not as an optimal account. Perceptive processes are processes of inert sensing. They differ from perception as activity (behaviour) -- *watching, looking*, etc.

macrophenomenal (composite phenomenon realized by a nonfinite clause):

We saw Henry eating

metaphenomenal (factual phenomenon realized by a finite clause):

We saw that Henry had eaten

The second system, general / specific, has consequences for the realization of Process; it makes a distinction between two sets of verbs, those that do not specify a specific mode of perception (*sense, perceive, ...*) and those that do. The relevant parameter is thus a circumstantial one, viz. manner:

circumstance: manner:
visual / auditory / ...

Those specifying the modality are further differentiated according to the type of modality in the system TYPE OF MODALITY, visual / auditory / gustatory / etc., each term corresponding to a small set of verbs of perception.

As the example illustrates, the system network can specify lexical sets such as *see, notice,* and *behold,* stopping short of specifying unique lexical items. As a result, there would be free variation in generation unless further distinctions are introduced.

Reactive. Reactive mental processes represent an affect; a mental reaction of fear, joy, desire, and so on to some phenomenon. The subtypes include fearing and liking. One of the properties of reactive processes as a lexicogrammatical class is the scalar nature of the verbs realizing them, which is rare among verbs (as opposed to adjectives). For instance, it was noted above that 'frighten' and 'terrify' are related in terms of degree: the lexical function Magn applied to 'frighten' yields 'terrify'. The feature of intensification is quite common in the class of reactive processes:

nonintensified (normal)	**intensified** (high)
scare, frighten	terrify, horrify
like, fancy	love
please	thrill
dislike	hate
enjoy	love
wish	want, desire
amuse, tickle	break - up
upset	devastate
interest	intrigue
puzzle	mystify
etc.	

At least provisionally, we can set up two simultaneous systems, one for the type of reaction and one for the intensity.

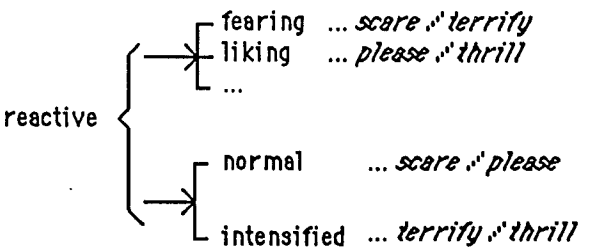


Fig. II:4-24: Type & intensity of reaction

Collocation. Let's now turn to a brief consideration of patterns of collocational conditioning in the area of cognition and reaction. As in the case of the selection of a process of reaction, intensification plays an important role: alongside general specifications of high degree, such as *very much* and *a good deal,* we find more specific expressions, in particular *deeply* (reactive) and *completely* (cognitive); for example:

She understands him completely but she dislikes him deeply.

The table below gives further examples of pairs of Process + Manner: degree.

		Process	Medium	Range	Manner: degree
mental	reactive	love hate dislike like admire respect			deeply
	cognitive	understand believe forget convince			completely

To represent the combination of Process: reactive (*love, dislike, fear, upset, offend, disturb, ...*) + Manner: degree (*deeply*), we can simply set up a system which allows us to choose to express high degree in terms of depth if the process type is reactive:

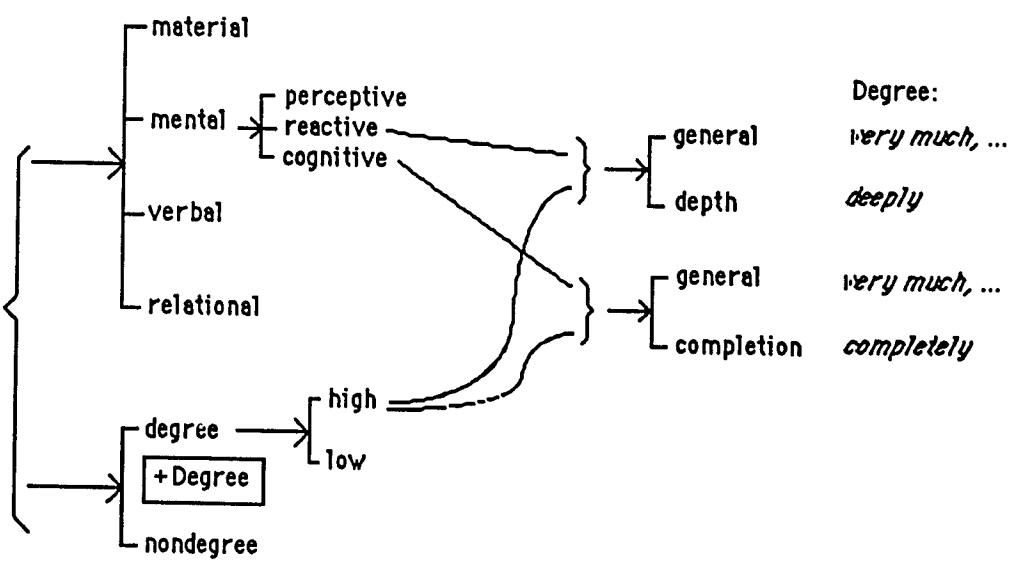


Fig. II:4-25: A simple strategy for conditioned lexical choice

(With metaphorical mental processes on the relational model, we find collocations between Process and Range; for example: *have + dislike (for), have + fear (of); hold + attraction (for).)*

4.5.3.1.2 Relational: intensive & ascriptive

Relational processes are either ascriptive or equative and simultaneously intensive, possessive, or circumstantial. I will focus on the part of the lexicogrammar of relational transitivity that develops the combination of 'ascriptive' and 'intensive'. The distinctions in this area are concerned with the nature of the process itself -- is it phased or not and if it is, what is the nature of the phase? -- and with the nature of the attribute being ascribed. These are distinctions embodied in the verbal group rather than in the nature of participants and circumstances; they are akin to verbal group complexes such as *begin to do, keep doing; seem to do,* and *prove to do.* For a subclass of relational processes, the nature of the Range determines the system of alternatives. The categories of distinctions can be summarized as follows:

process: phase:

reality: apparent (*seem*) / real (*prove*)

time: inceptive (*become*) / durative (*remain*)

participant:

range (attribute): type of quantity (*cost/weigh/...*), etc.

There are various ways of organizing these contrasts; here I will take the opposition between 'phase' and 'nonphase' to be the most basic. A system

network based on this assumption is presented below:

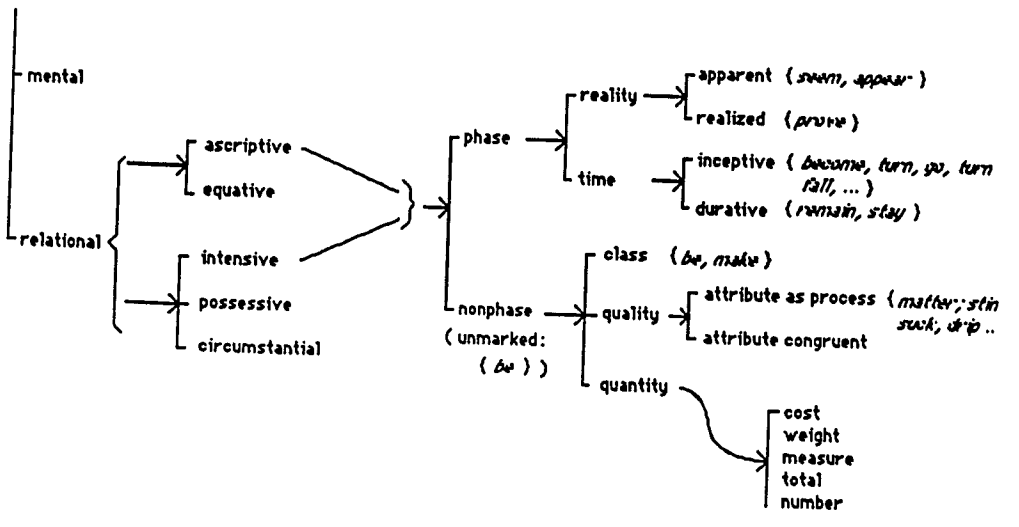


Fig. II:4-26: Ascriptive & intensive relational clauses

If 'phase' is selected, the next system differentiates between reality phase and time phase. The first type is further differentiated into 'apparent' and 'realized' and the second into 'inceptive' and 'durative'. These are options concerned with the nature of the process itself. If 'nonphase' is selected, the nature of the attribute comes under consideration. The first system distinguishes 'class', 'quality', and 'quantity'. The unmarked realization of the Process for all of these is *be;* but each subtype leads to other alternatives as well. If the attribute is a class, *make* is an alternative, as in *Henry makes a good husband; this dish makes a good appetizer,* and the clause can be benefactive (not represented in the system network): *Henry makes her a good husband.* If the attribute is a quality, this quality is typically represented congruently as Attribute; but it may

also be represented as a qualitative ascriptive Process (*matter; suffice; stink, suck, drip*). This latter option only exists for a small set of qualities (importance, sufficiency, and (negative) informal evaluations). If the attribute is a quantity, the particular process depends on the nature of the quantitative ascription -- cost, measure, weight, and so on.

Collocation: process + range (attribute). When the ascription is a quantitative one, the selection of the verb realizing the Process depends on the nature of the quantity: *cost* goes with monetary measures, *weigh* with measures of weight, and so on. This dependence is of the same type as lexical collocation. In the area of ***inceptive*** intensive processes, there are a number of collocational restrictions on the combination of Process + Range (i.e., Process + Attribute, since the Range of a relational clause is the Attribute); the verbs also have material uses. The lexicogrammatical feature 'inceptive' is thus a good illustration of how certain categories correspond to lexical functions. Examples are tabulated below.

		Process	Medium	Range
relational	inceptive	become		---
		fall		[illness:] ill, sick, lame; victim
		go		['madness':] mad, crazy, insane, nuts, bananas; [colour:] white, crimson, red; bad
		turn		traitor, teetotaler, sour
		grow		old, sleepy, tired, restless,
		run		dry
		come		true

Fig. II:4-27: Collocations involving Process + Range (inceptive)

4.5.3.1.3 Verbal

I have presented some examples of verbal processes to illustrate the continuity between grammar and lexis (see Section 5.1); here I will focus on collocations.

Collocation: verbal. Verbal collocations involve **Process + Range**. Like material ones (see Section 5.3.1.4), they always involve a grammatical metaphor.[19] What would be represented congruently as the process is

[19] Cf. also mental, metaphorically represented as possessive or intensive relational clauses:

represented metaphorically as the range.

In the verbal case, the verb may be *make* (as it often is in the material case), but it may also be *issue, ask, tell,* or *express: make + suggestion, issue + command, ask + question, tell + lie,* and *express + doubt.* The strategy with *express* involves a verbalization of a sensing, i.e., of a mental process: *express + doubt* (cf. *doubt*), *express + belief* (cf. *belief*), *express + fear* (cf. *fear*), and so on. There need not be a corresponding cognate mental verb; cf. *express + view, express + opinion,* etc.. There may be an addressee as Adjunct: *he expressed his belief to me that the negotiations would collapse.*

	Process	Medium	Range	Manner: degree
verb.	'perform'		[speech functional category:]	
	make		statement, claim, argument; suggestion, proposal, request, promise	
	ask, issue		enquiry, question, report; demand, command, order, directive	
	tell		lie, truth	
			[genre category:] story, tale, fable	
	express		[sensing:] hope, fear, desire, doubt, conviction, belief, view	

hold + belief / opinion, have + doubt / feeling; be afraid, be angry.

4.5.3.1.4 Material

Material clauses are generalized action clauses -- generalized because they include actions as well activities and events; i.e., material processes include both doings and happenings. Hasan (1987) presents a study of one subfield within the field of **doings: disposal**. I will summarize it as an example of material lexis.

In the example of processes of perception and intensive ascription, we are extending the network in such a way that the terminal features correspond to word senses. The field of perception is essentially organized according to a single dimension of classification, what I called the manner of perception. The field of intensive ascription is organized according to one dimension at a time, phase (reality and time) and type of attribute (weight, cost, etc.). However, just as in the grammatical part of lexicogrammar, we can expect to need to use simultaneous systems for simultaneous dimensions.

When we turn to material processes, we often find intersecting dimensions. It seems reasonable that material processes should be experientially more complex in this way than relational and mental ones: material processes typically involve *change* and change opens up a number of possible dimensions. We find an example of this in Hasan's account of processes of gathering, accumulating, and so on. A number of systems intersect to define these processes, as can be seen from the following extract from Hasan's system network.

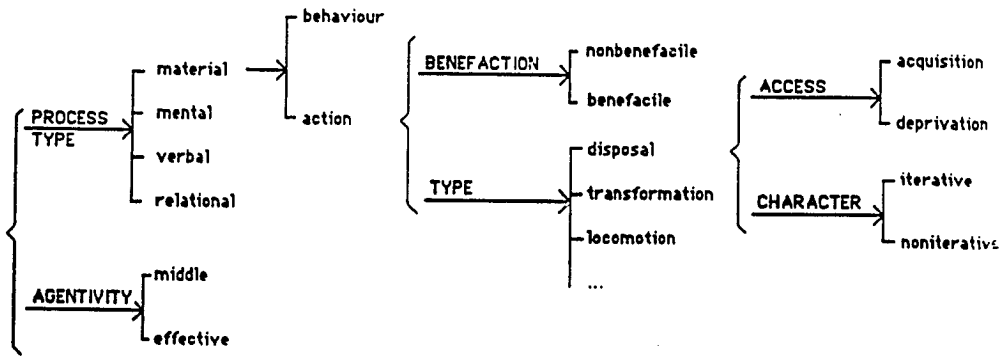


Fig. II:4-28: Part of Hasan's (1987) network for processes of disposal

The most delicate features of this network combine to define sets of lexical items; these sets are tabulated below. The network Hasan has worked out extends in delicacy to the point where the members of these sets can be distinguished, more specifically the different senses of the members. These further differentiations are indicated in the table; the features are taken from Hasan's complete network.

	acquisition		deprivation	
nonbenefacile			independent solid *strew* liquid *spill* cooperative *share*	
benefacile	*buy*	unitary *gather* neutral unmarked *collect* vast *accumulate*	random *scatter* planned indeterminate *divide* determinate *distribute*	*give*
	non-iterative	iterative		non-iterative

Fig. II:4-29: Lexical items differentiated in Hasan (1987)

The differentiations involve features of participants as well as circumstances; e.g.

participants:

medium: solid (*strew*) / liquid (*spill*)
vast (*accumulate*) / unmarked (*collect*)

circumstances:

accompaniment: cooperative (*share*) / independent (*strew, spill*)

manner: random (*scatter*) / planned (*divide, distribute*)

In the discussion of the other process types, I illustrated how the move from less delicate grammatical oppositions towards more delicate lexical ones makes contact with collocationally related pairs such as Process + Medium. We can see the same tendency in Hasan's description. For instance, *spill* occurs with a liquid Medium; we can expect collocations such as *spill + water, spill + milk,* and *spill + oil.* Now these combinations are most likely not what would normally be thought of as instances of collocationally conditioned choices, although they may be; it is in any case a matter of degree and even related languages will draw the lines in different ways.

Collocation. The are two collocational pairings in material clauses, viz. (i) Process + Medium and (ii) Process + Range.

(i) Process + Medium. Change in quantity, i.e. increase / decrease, was illustrated above in Section II:4.5. It is one of a set of features of material process type in the context of which we find process + medium pairs. Other general features include change in quality, growth & improvement (*repair +* [mechanical device such as] *car, heal + wound; ripen + fruit, mature + child, age + wine*) or deterioration (*decay + teeth, rot + meat, wilt + flower*), phase: beginning (*break out + war*), behaviour: typical sound (*neigh + horse, bark + dog*), behaviour: typical movement (*waddle + duck, trot + horse, counter + horse, flap + wing, crawl + snake*), behaviour: ingesting (*breathe + air, inhale + smoke, drink + liquid, take + medicine*), and preparation for use (*make + bed, lay + table*). The diagram below presents a partial typology of these features.

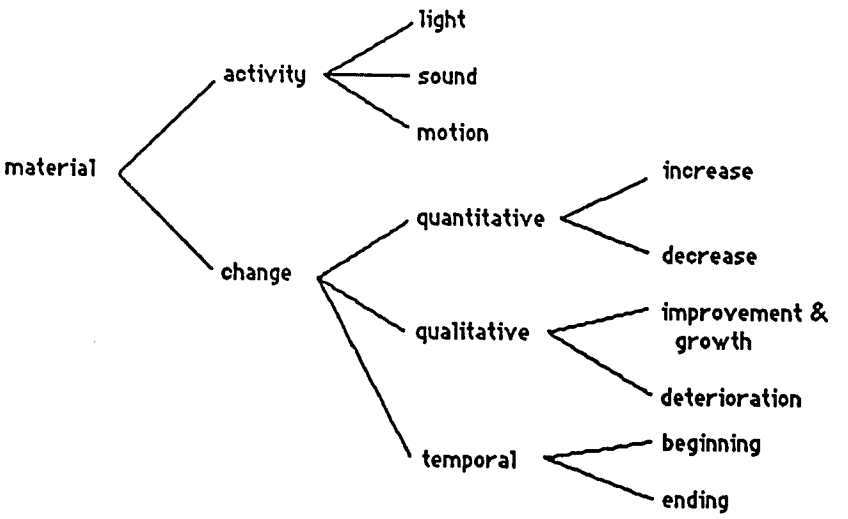


Fig. II:4-30: Partial typology of features underlying Proc + Medium collocations

Within this partial typology, the two main areas are activities and changes. Further examples are listed below.

Process	Medium	Range	Manner: degree
'deteriorate'			
rot	meat		
decay	teeth		
decay	morale		
decay	values		
'increase'			
rise	temperature		
climb	price		
'decrease'			
fall	temperature		
drop	price		
'begin'			
break	day		
launch	program		
'remove -'			
shell	peas		
peel	orange		
pit	plums		
'sound'			
crow	cock		
neigh	horse		
'ingest'			
take	medicine		
breathe	air		
inhale	smoke		
'prepare, produce'			
make	bed		
lay	table		
cook	dinner		
manu-facture	excuse		
misc.			
beat	egg		
shed	tear		
set	sun		

There is also a type of Process + Medium pair involving ***grammatical metaphor*** where the congruent process is coded metaphorically as Medium and the metaphorical process is realized by a verb such as *give, extend, lend or receive: lend/give/receive + support/help, give/receive + aid/advice;* and also *give + hug/smile/kiss/cry, give + push/blow,* etc.:

'perform' give lend receive	help, aid, support, assistance, lecture, talk smile support support		

The general meaning is here 'perform'. There is a similar type involving Process + Range.

(ii) Process + Range. I noted above that collocations of Process + Range always involve grammatical metaphor in material and verbal clauses. In the material case, the process is realized by general verbs such as *take, make, do,* or *have* or, sometimes, a more restricted one such as *cut: take + bath* (cf. *bathe*), *have + dinner* (cf. *dine*), *do + dance* (cf. *dance*), *make + mistake* (cf. *err*); *cut + caper.*

	'perform' do take make		dance shower mistake	

4.5.3.2 Prepositional phrase

Since prepositions constitute a more or less closed class, the 'transitivity' of the prepositional phrase can be set up to include lexical prepositional systems without any problems; this is one area where the Nigel grammar treats 'lexis' as most delicate grammar.

Collocations. In the prepositional phrase, we find combinations of Minorprocess + Minirange, with a conditioned choice of the preposition realizing Minorprocess. There is often a spatial metaphor involved: *in + trouble, out of + danger, in + love, on + list, in + mind,* etc..

4.5.3.3 Nominal group

The system network discussed in Section 4.4.1 illustrates the kind of lexical system network we can expect to find in the nominal group. At the least delicate end this lexical network will make contact with lexicogrammatical categories such as 'mass', 'count', 'concrete', and 'abstract'.

Collocations. There are also lexical relations between the head of a **nominal group** and a small set of nominal group functions, Epithet: degree and the predeictic function Facet.[20] It thus appears that most of the nominal group functions do not, as a rule, enter into collocational pairings of the type described by lexical functions (Epithet* and Classifier* indicate that there may

[20] The function Facet was discussed in Section II:3.2.6.

be several epithets and classifiers):

Facet	Deictic	Postdeictic	Ordinative	Numerative	Epithet*	Classifier*	Thing	Qualifier
lump word item							sugar advice news	
					[degree:] heavy strong		traffic tea	

Fig. II:4-31: Collocations in terms of n.gp. structure

Epithet: degree + Thing. We find relations between the head and expressions of degree, intensity, strength, etc. -- Epithet: degree + Thing, e.g.:

Epithet:	**Thing:**
heavy /light	+ traffic / trading / commerce /
strong /weak	+ tea /coffee /whiskey /tobacco /
powerful	+ computer / car / engine /
deep	+ tan / red / blue /

Cf. also nominalizations:

deep	+ regret / love / admiration / respect /
complete	+ knowledge / trust // confidence.

Facet + Thing. We also find relations between the head and an expression of measure, type, etc. preceding the Deictic [determiner] in the structure of the nominal group -- Facet + Thing, for example:

Facet:	**Thing:**
measure: unit:	
piece	+ furniture,
lump	+ sugar,
pinch	+ salt,
word	+ advice,
item	+ news
head	+ cattle;
aggregate:	
school	+ fish,
herd	+ cattle,
flock	+ birds,
gaggle	+ geese;
type:	
brand	+ car /computer / detergent,
school	+ linguistics / philosophy / thought.

4.5.4 Grammar and lexis in generation

The examples in this section have illustrated the feasibility of the grammarian's dream as far as the system network potential goes. Lexis can be

integrated with grammar along the scale of delicacy. The question is how this works in an account of how lexicogrammar is used in generation. One issue that arises is how to state the choice between lexical and grammatical resources when both are available. This issue is a potential problem in generation and it has been a reason for not investing in an exploration of the grammarian's dream in the Penman project. -- As we have seen, the Nigel treatment of lexis does not follow systemic theory in treating lexis as the most delicate part of lexicogrammar.

As an illustration of the issue, we can take the nominal group and the old favourite example *bachelor* vs. *unmarried man,* which represent bachelorhood synthetically (Head/Thing: bachelor) and analytically by means of modification structure (Modifier: unmarried + Head/Thing: man) respectively:

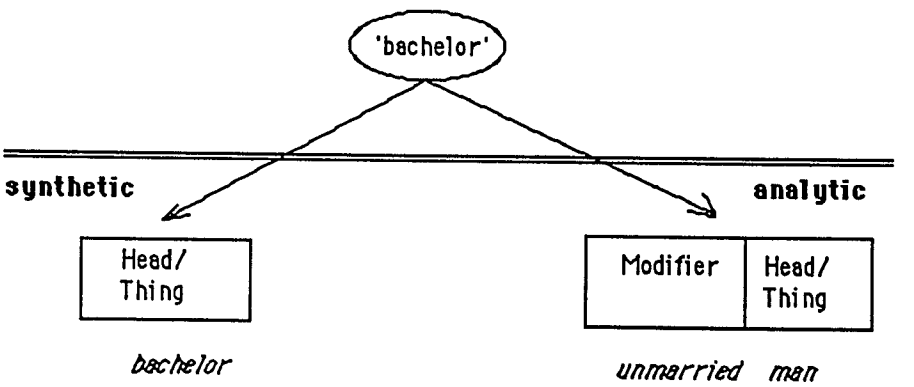


Fig. II:4-32: Synthetic and analytic realizations

How are the choices of *bachelor* and *unmarried* to be coordinated so that we do not end up with either plain *man* or pleonastic *unmarried bachelor?* If

the choice of *bachelor* does not occur until the most delicate end of part of the nominal group network, the option to have a modifier may already have been offered and the question is whether it should be taken up or not. If it is, we may get *unmarried bachelor.* If it is not, the generator may not find a term that fully covers what needs to be expressed: after all, there are lexical gaps in the system.

Given this situation, one conclusion is that the grammarian's dream is a pipe dream that cannot be maintained in generation. I don't think the consideration just mentioned is a reason not to pursue the grammarian's dream. Rather, I think it only points to the need to work hard at developing lexical descriptions for a number of well-chosen registers. The conclusions we can draw here for the grammarian's dream depend on a number of factors:

(i) To what extent is 'what needs to be expressed', i.e. 'what to say' determined prior to and independently of the lexicogrammatical resources?
(ii) What is the traversal order of systems in e.g. the nominal group network?
(iii) To what extent is there real overlap between the analytic strategy (Modifiers + Head) and the synthetic strategy (Head only)?

The first factor depends crucially on the semantic model used. The consequences are different depending on which of the two models I will discuss later on is used. From a grammatical point of view, the difference is reflected in the second factor concerning the traversal order, so I will leave the semantic factor until later and will start with the second factor here.

We can consider traversal order in the context of the nominal group with respect to systems for the type of thing at the head of the group and systems for modification. There are two alternatives: (a) the two sets of systems may be simultaneous; or (b) the systems may be ordered logically.

(a) Simultaneous systems. We can imagine a nominal group network where the systems for the classification of the noun realizing Thing and the modification systems are simultaneous:

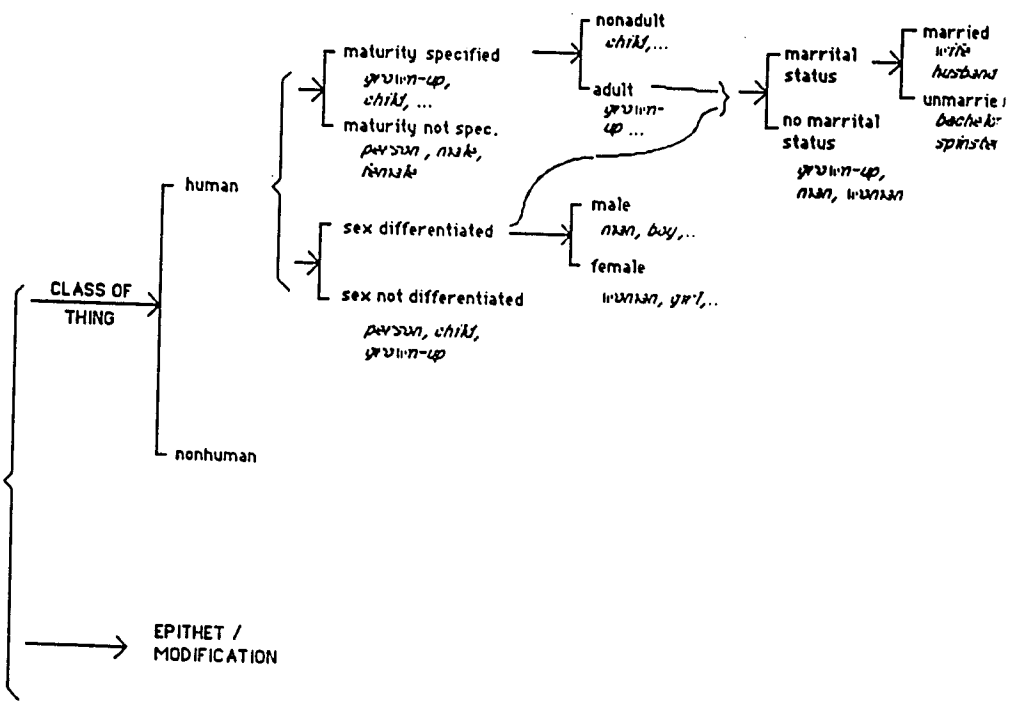


Fig. II:4-33: MODIFICATION and CLASS OF THING as simult. systems

Without further specification of how to traverse the system network, the MODIFICATION systems could easily be entered before the system marital status specified / marital status not specified is entered.

(b) Logical ordering. However, alternatively, we can focus on the logical nature of the organization of the nominal group. The logical metafunction brings out the organization of a group as a *word complex* (cf. Section II:3.2): to a certain extent, this group as word complex is built up when a word simplex cannot do the expressive job alone. The logical metafunction orders the systems as follows:

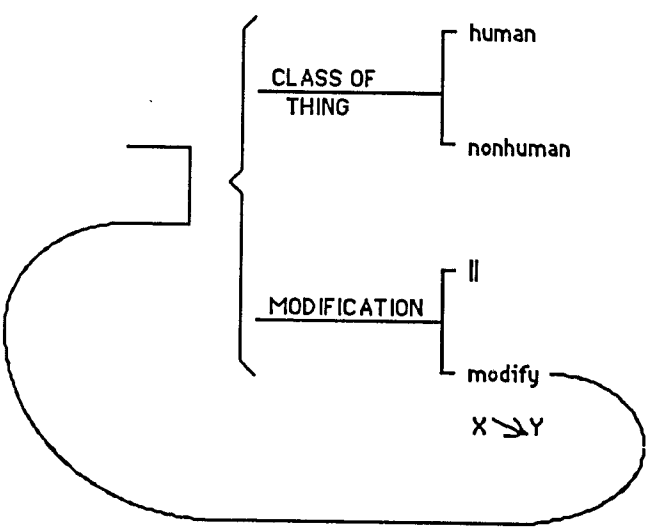


Fig. II:4-34: The logic of modification

The first time a choice is made from CLASS OF THING and the more delicate systems dependent on it, the Head (α) of the nominal group is developed. If the

option 'modified' is selected in the MODIFICATION system, a new link is added to the structure of the nominal group and the systems CLASS OF THING and MODIFICATION are reentered to specify the class of the modifier (β) and perhaps to add another one (γ). This process continues until the appropriate 'word complex' has been constructed.

The logical metafunction gives the structure an ordering as a dependency chain, whose starting point is the head. As we have seen, the nominal group is expanded link by link along the chain, starting with the head:

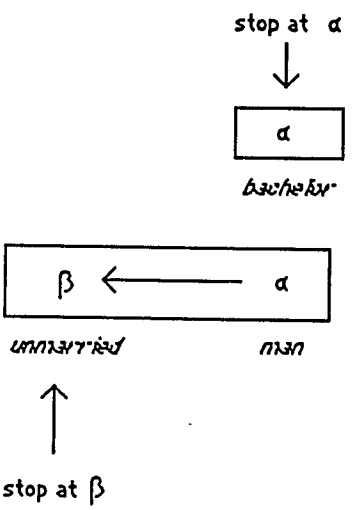


Fig. II:4-35: Synthetic vs. analytic in logical ordering

If bachelorhood is to be expressed, it can be expressed as α is developed by the choice to specify marital status. If marital status is not expressed at α, the option to modify can be selected and β can be developed. That is, assume we have an expressive need. First we ask whether a word simplex is sufficient for

the current needs; the system network for the classification of things serves as the guide in this exploration. If there is no more meaning to be coded, a word simplex is sufficient and we can stop at α. If there is more meaning to be expressed, we choose to develop a word complex. The first step is β. It may also be the last step, but we can continue with γ if we need to.

The approach based on the logical ordering of modification allows for the exploration of the lexical resources available for the realization of α before going on to β. That is, because of the logical ordering in the structure, the position of lexis as most delicate grammar does not mean that the option of choosing *bachelor* comes after the option of deciding to use *unmarried* as a modifier.

The approach raises an important question concerning the organization of the nominal group, viz.: to what extent can it be regarded as a word complex? This question is another way of asking question number (iii), raised earlier: to what extent is there overlap between the analytic strategy and the synthetic one?

One way of exploring these questions is to investigate what are possible lexical items, as McCawley (e.g., 1971) does. He offers a number of constraints. For example, he suggest that English cannot have a verb *flimp* meaning 'kiss a girl who is allergic to', since this would violate the complex NP constraint: *Bert flimped coconuts.* This constraints and others like it are specific to transformational grammar[21] and will not help us here; but we can still explore the question of what kinds of meanings can be realized by a lexical item.

21 Cf. Section II:1.2.2.

With respect to nouns and the nominal group, the situation seems to be roughly as follows. The nominal group gives the resources for doing two things:[22] (i) it is oriented towards the context of culture; and (ii) it is oriented towards the current context of situation.

(i) It gives us the resources for representing some *general* class of experience and its properties. The Head of the nominal group and those premodifiers in the logical structure which have the functions Classifier and Epithet in the experiential interpretation of the logical group can clearly be treated as a word complex -- a complex noun -- and they express meanings which can, in principle, also be expressed by a single lexical noun. The following dictionary definitions (adapted from Webster's Seventh New Collegiate Dictionary) illustrate this simple observation.

reactant	(β:)	chemically reacting	(α:)	substance
sanctimony	(β:)	assumed or hypocritical	(α:)	holiness
sanctum	(β:)	sacred	(α:)	place
knock	(β:)	sharp	(α:)	blow
framework	(β:)	basic	(α:)	structure
driblet	(β:)	falling	(α:)	drop
contraband	(β:)	illegal or prohibited	(α:)	traffic

All the nominal groups used in the definitions are what Fries (1970) would call reduced noun phrases; in particular, there is no Deictic element. The definition

22 These two simultaneous perspectives explain why both Thing and Deictic (to put it in our terms) have been interpreted as the Head of the nominal group. Traditionally, Thing is taken to be the Head, but Hudson (1984) argues that Deictic should be analysed as the Head. There is a third perspective as well -- the interpersonal perspective: attitudes, evaluations, and so on. These meanings are like (i) below in that they can be expressed either 'synthetically' as connotations or 'analytically' as attitudinal epithets.

of a lexical noun often includes postmodifiers (qualifiers) as well as premodifiers of the types mentioned, of course. Thus we find examples such as the following.

cottage	the (α:) dwelling (β:) of a rural labourer or small farmer
feature	the (α:) structure, form, or appearance (β:) especially of a person
object	(α:) something (β:) that is or is capable of being seen, touched, or otherwise sensed

(The Deictic realized by *the* in the first two examples is one of structural cataphora.) These qualifiers still represent general classes of experience; for instance, the present tense represents generalized present time.

(ii) The nominal group gives us the resources for specifying a *situationally characterized* referent. The main burden of this task is carried by the Deictic: it specifies the referent as identifiable or non-identifiable (in a particular situation), as near or far, and so on. Since they are variable and situation specific, these meanings can only be realized by the determiner serving as Deictic and not by lexical nouns. Consequently, there is no overlap between the analytic strategy and the synthetic ones in this area; determination can only be expressed analytically.

There is nothing surprising about the observation that determination lies outside the field of meanings expressed either by a lexical noun or by a 'noun

complex'. The incorporation of the observation into the logical account of the nominal group given above is also quite straightforward:

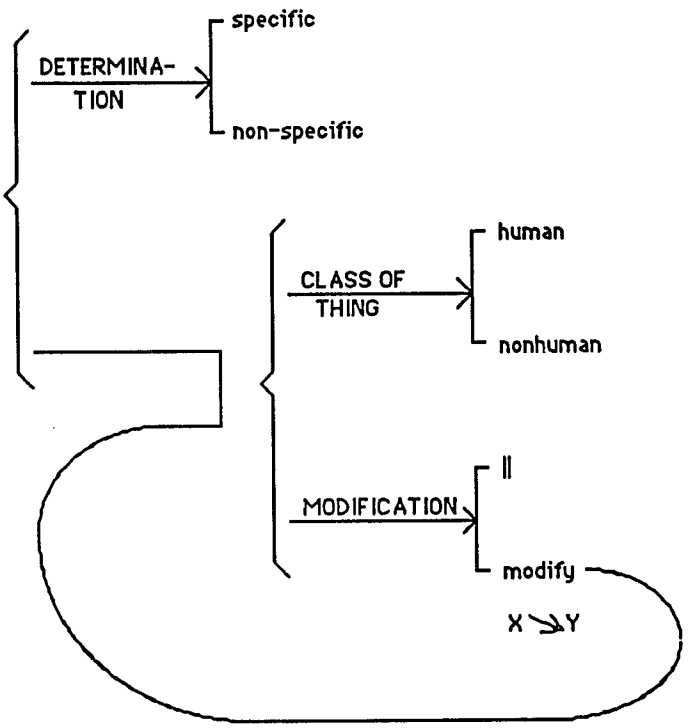


Fig. II:4-36: DETERMINATION and MODIFICATION

The system DETERMINATION and those systems dependent on it are outside the recursion of MODIFICATION. Thus, while the determination choices are made once in the traversal of the nominal group and are independent of the modification choices, the latter are made as many times as required and always in the context of the previous cycle through the loop.

It is also clear that Predeictic, Postdeictic, Ordinative, and Numerative cannot be treated as a word complex together with the Head in the same way as Classifiers and Epithets can: they are concerned with situation-specific meanings. The Postdeictic is concerned with how the current set of referents are related to a previously established one instantiating the same general class as the class of the Thing and its modifiers; they are related as identical, similar, or different. Alternatively, it specifies how the current set of referents are related to the potential set of referents of the general class of the Thing and its modifiers; they are related according to how the current set of referents have been selected out of the total set of potential referents: on the basis of fame, typicality, usuality, and so on.

The Ordinative specifies the ordering of the current referents as members of a set of referents of the same class. Note that the Ordinative can be qualitative, i.e. a superlative. Thus, 'nextness' is an instantial property, just as specificity is; for instance, the nominal group *the next palace* in the following example --

> The next *palace* is the Hall of the Preservation of Harmony, or Bao He Dian.(Fodor's Beijing)

-- achieves two things simultaneously. It says that there is a specific (identifiable) next and that it is of the class of palace:

instance (referent)	class
the next	palace

While we can expect to find lexical items of Classifier + Thing: 'palace' (*summer palace, winter palace,...*) corresponding to *palace* = Classifier: *royal* Thing: *residence;* we would not expect lexicalization of 'the next' + 'palace', etc.. (Apparent exceptions: *predecessor, successor, first-born,* etc..)

The Numerative specifies the number of the current set of referents and there is good reason not to expect lexicalizations of Numerative + Thing. (Apparent exceptions: e.g. pre-numeratives such as *a couple* = 'a couple [of people].)

~*~*~*~

The preceding discussion has been brief and informal. Nevertheless, I hope it has served to indicate that the grammarian's dream and the fact that meanings can be expressed either lexically alone -- 'synthetically' -- or lexicogrammatically -- 'analytically' -- are not in conflict. Rather, the logical organization of groups and the continuity of lexical choices from grammatical ones allow lexical delicacy and grammatical linear recursion to complement one another.

4.6 Interpersonal and textual lexis

Moving from the consideration of how to represent the lexical resources of a generator from an essentially ideational point of view, let's consider very briefly what, more generally, are the factors that will determine lexical choice in generation. As within the grammatical part of lexicogrammar, each metafunction makes a contribution:

- ideational 'denotation'
- interpersonal 'connotation'
  - formality & politeness
  - affect
- textual : lexical cohesion (repetition, synonymy, ...)

Fig. II:4-37: The metafunctions and lexis

From an ideational point of view, lexis is concerned with 'denotation' and it is organized as taxonomies of things, events, and so on. From an interpersonal point of view, lexis is concerned with 'connotation', including formality and politeness as well as affect. From a textual point of view, lexis is concerned with the creation of text, more specifically with lexical cohesion.

4.6.1 Ideational lexis

Starting with **ideational** considerations, we may note the traditional concern with denotation: a lexical item is chosen so that appropriate denotation is achieved. This is only partly helpful, since it does not give us an account of what "appropriate" means. There is considerable variability just in terms of delicacy. For example, according to Berlin et al. (1973), there are typically five levels in folk taxonomies and the depth is increased in technical taxonomies. How does a text generator select the "appropriate" level? Clearly, there are registerial tendencies; lexical density is higher in typically written text than in typically spoken text (cf. Ure (1971); Halliday (to appear)).

4.6.2 Interpersonal lexis

Interpersonal considerations have traditionally been discussed under the heading of ***connotation;*** they cover a number of tenor-related factors. They have usually not been considered in generation systems, but Hovy & Schank (1984) and Hovy (1986) are exceptions. Hovy built a system for generating news items. It is sensitive to the reader's sympathies and interests and these factors are taken into consideration in lexical selection (as well as other aspects of the generation process). For instance, the following two excerpts are taken from texts written for an IRA terrorist and a neutral American, respectively (Hovy & Schank, op cit.: 190-1):

> An Austin car was used by two *freedom-fighters* to escape from Belfast Football Stadium yesterday.

An Austin car was used by two *terrorists* to escape from Belfast Football Stadium yesterday.

The tenor-related factors fall into two broad categories, formality and affect. For example:

(i) Formality

... but our grant of sixteen thousand *quid* terminates at the end of seventy-six (CEC, 791)

(ii) Affect

(answers telephone) Excuse me (speaks for some time on telephone) *Stupid bastard* (continues speaking on telephone) Isn't it *bloody extraordinary*. Make me sick, some of these *bloody* people that come on, you know. It's just sort of one word every about ten seconds coming out. (CEC, 785)

... but the *unfortunate* thing is that Mrs. Morton is away this week so I'll have to look it up myself (CEC, 787)

... even at the local school level where pressure groups are still strong because parents still want their *bloody kids* to go to school if only to allow mum to go out to work (CEC, p. 792)

... and what they will probably come up with at the end of the day is a proposal for a cassette tape of the whole *bloody* issue (CEC, 796)

... and I said I am not competent to do it and I wouldn't have me name on the title page to do it and I said I'm *bloody* sure that Hilary and Gavin aren't competent to do it either ... (CEC, 802)

How can we integrate interpersonal lexis with ideational lexis? There would seem to be two ways of representing interpersonal lexis in relation to the ideational system network. We can represent interpersonal systems globally or locally.

(i) Globally: interpersonal systems are represented as an interpersonal network simultaneous with the ideational one. This network would state the interpersonal choices that are available in principle.

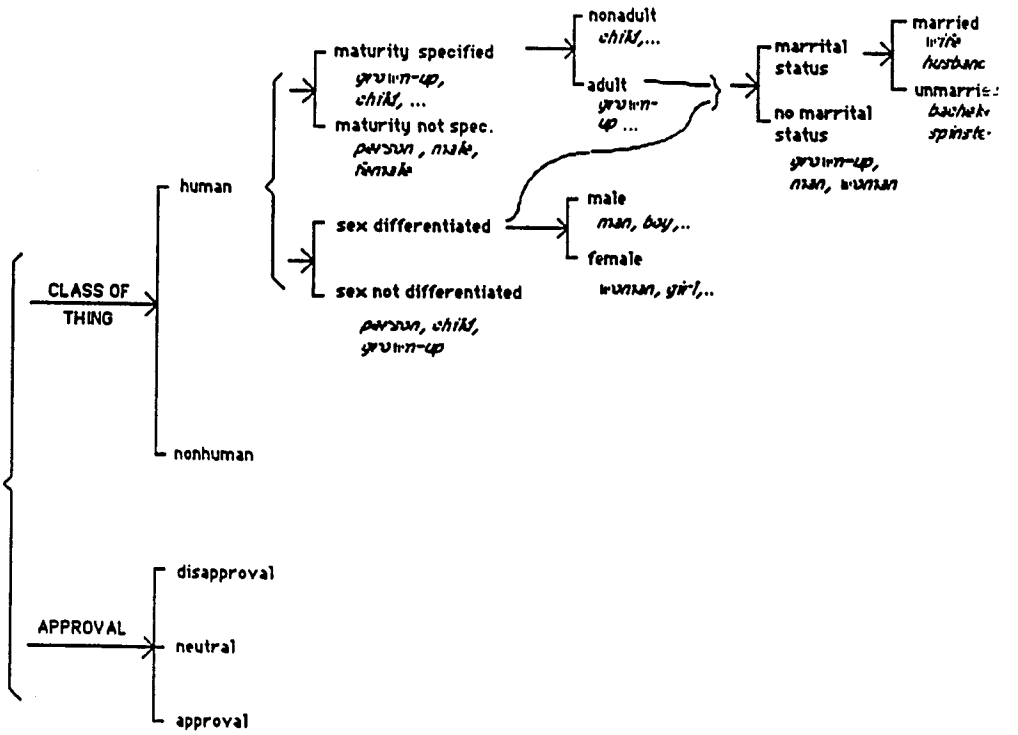


Fig. II:4-38: Interpersonal system of APPROVAL as global system

I said that these choices are available in principle. However, not all combinations of interpersonal and ideational features would be realizable.

(ii) Locally: interpersonal systems are represented locally, in the context of particular ideational distinctions.

4.6.3 Textual lexis

Textual considerations have to do with ***lexical cohesion*** (Halliday & Hasan (1976)). For example, one lexical cohesive strategy is to move from a specific lexical item in one mention to a more general one in a subsequent mention, as is illustrated in the following excerpt.

> One of the very largest dinosaurs was Brontosaurus (bron-toe-SAWR-us). This giant was about 70 feet and probably weighed as much as 30 tons. (Dinosaurs)

Here the choice of the general term *giant* serves to summarize the information given about the dinosaur: 'creature + large size'.

As with interpersonal lexis, hardly any attention has been paid to this in text generation. Granville's (1983) generator Paul, which was developed at IBM and makes use of Heidorn's (1972) Natural Language Processor work, is an exception. He presents a system for lexical substitution in text generation based on Halliday & Hasan's work. When a referent has been mentioned, the generator can choose among strategies involving pronominal reference, repetition, a superordinate term, a general noun, and a synonym. These strategies are ranked according to their ability to be used to identify a referent unambiguously; for example, pronouns are weaker in this ranking than repetition together with the definite article. The tasks in which anaphoric reference to an antecedent is needed are also ranked depending on e.g. the distance to the antecedent and on topicality (called focus by Granville). The ranked referring strategies are then matched against this ranking of referring

task and a referring strategy is picked according to the match. This method is quite similar to Givón's approach to cohesion in terms of topic continuity (Givón, 1983). As Granville points out, the generator is insensitive to many important considerations such as text organization and paragraph boundaries (cf. Hinds, 1977), but the work is important in that it illustrates how one aspect of lexical cohesion can be approached in text generation.

Let's explore how textual lexis can be represented and manipulated in general in text generation. We can do this in two steps:

(i) textual lexical resources are represented as simultaneous with ideational lexis;

(ii) textual lexical resources are represented in terms of ideational lexis.

(i) We can set up a small system network for the possibilities of reiteration that are available to the speaker in general.[23] The most general option is between retaining the same degree of specificity or generalizing:

[23] I will not discuss collocation as a factor in lexical cohesion.

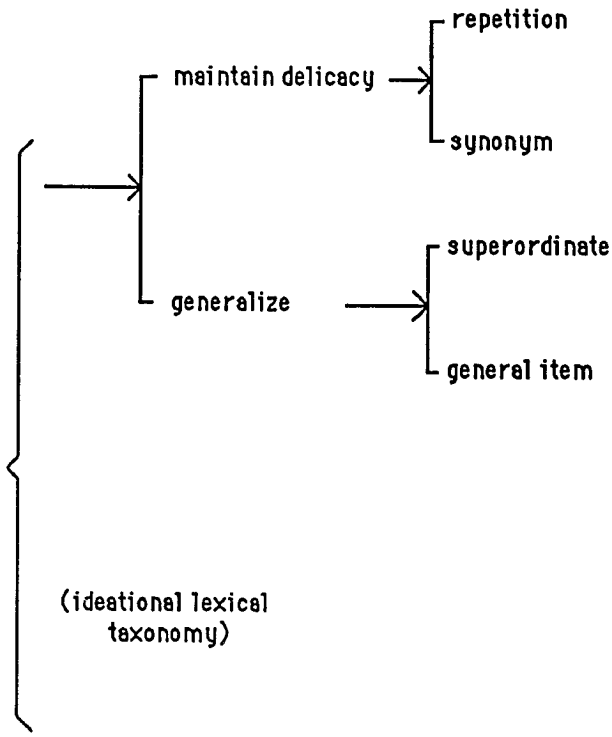


Fig. II:4-40: Textual lexical options as simultaneous w. ideational lexis

These options can be illustrated from short encyclopaedic entries on dinosaurs; for instance:

maintain: repetition

Pebbles in the stomach probably ground up the plant material so that it could be digested easily. *These* *pebbles* were very numerous and ground smooth from the active motion within the stomach. (100 Dinosaurs)

maintain: synonym

There were large numbers of cone-shaped, bony *studs* arranged in rows along the back. They were extremely hard and would have damaged the teeth of the strongest predator.There is an interesting arrangement of *these projections* just behind the head, where they form groups of three. (100 Dinosaurs)

generalize: superordinate

Apatosaurus was a sauropod and belonged to the diplodocids. As far as we know, *these dinosaurs* were the longest ever to live on the Earth. (100 Dinosaurs)

However, from studying the fossils some scientists are convinced that *Avimimus* had wings with features on them. But closer study of the wings showed that *the bird* was unlikely to have used them for flight because they were very weak. (100 Dinosaurs)

Avimimus had large *eyes* which gave it a good view of things while it was moving along. One other interesting *feature* of this small animal was its large brain. (100 Dinosaurs)

generalize: general item

Antarctosaurus was one of the group of sauropods, or "lizard feet." *The creatures* probably fed on plants which they stripped off using their teeth. (100 Dinosaurs)

As an added means of self-defense *the ankylosaur* had a club on its tail. *The creature* may have been able to swing the club with great force and aim a savage blow at an enemy. (100 Dinosaurs)

While the textual system network presented above as simultaneous with the ideational lexical taxonomy serves to display what the cohesive options are at

any point in a text, the network is in fact not independent of the ideational lexical taxonomy. Rather, it operates in terms of this taxonomy.

(ii) The second alternative in dealing with textual lexis is based on the observation made earlier (Section II:3.2.6) concerning the nature of the textual metafunction. This metafunction is the ***enabling*** one, serving to aid in the presentation of ideational and interpersonal meanings as text; and, in contrast to the other two metafunctions, it is strictly a ***second-order*** category. That is, the ideational and interpersonal metafunctions relate to 'realities' that exist independently of language, to field and social relationships, respectively -- they denote field categories and connote categories of tenor (affect, politeness, etc.). However, the textual metafunction is concerned with the ***'symbolic' reality*** that comes into existence with language; it does not denote or connote extra-linguistic categories.

The second-order nature of the textual metafunction is reflected in its mode of expression. For instance, in grammar, while it does not create constituency, it employs the opportunity of manipulating sequence opened up by the existence of constituency. And we can think of the resources of textual lexis in the same way. The ideational metafunction creates a taxonomic organization of lexis -- the categories needed to represent the first order categories of experience (field categories). Once this taxonomy has come into existence, the textual metafunction can employ the opportunities created by the taxonomy: more specifically, it can assign textual meanings to movements up and down the taxonomy and to repetition vs. synonymy. The interplay between ideational and textual considerations in the creation of the ideational lexical taxonomy is surely

not as sequential as I have just suggested. Just as near-synonyms may be accepted for interpersonal reasons -- cf. for example Latin and Germanic pairs such as *maternal* (scientific, formal) vs. *motherly, canine* vs. *dog,* etc. -- so their very existence may serve primarily textual uses.

Now if we take a simple field of lexical taxonomy, we can think of textual systems as operating in terms of the organization defined by the ideational system network. Assume that we are about to make a lexical selection for a non-initial mention. The previous lexical selection was *canine* and the following ideational and textual alternative are available.

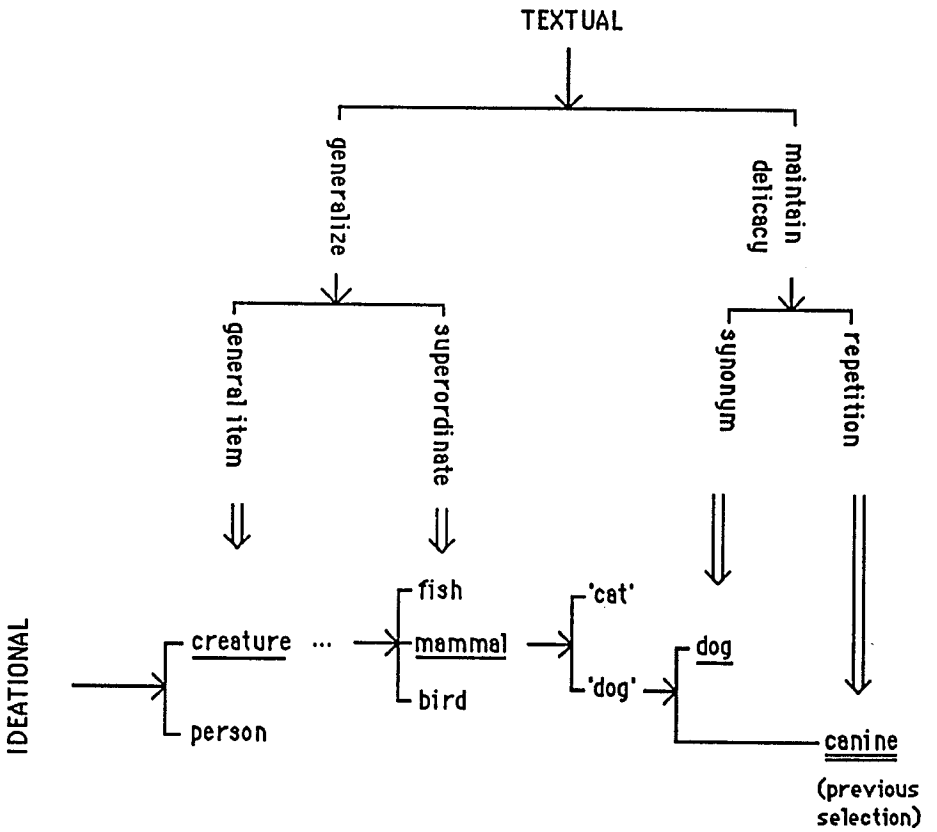


Fig. II:4-41: Ideational and textual options: symbiosis

One way of capturing the textual use of ideational lexis is to add textual factors to the considerations taken into account when an ideational choice is made (for instance, by incorporating them into the choosers of lexical systems). Thus the choice of 'creature' would not only be influenced by an ideational consideration of the animacy of the thing being represented but also by a consideration of prior mention and whether it was desirable to avoid repetition, to mark a change in the organization of the text, and so on. Since the textual possibilities open at any given time in a text depend on the discourse context -- on the history of related choices -- these textual possibilities have to be stated so that they are dynamically variable. The choice in context can be illustrated from the following three paragraphs from the entry on Antarctosaurus.

> ***Antarctosaurus*** was one of the group of sauropods, or "lizard feet." *The* *creatures* probably fed on plants which *they* stripped off using *their* teeth. With such long necks *they* could reach up high to pick at the best vegetation which many other creatures were unable to reach. [...]
>
> The head was very small for the body, measuring only 24 inches (60 centimeters) in length. No complete skeletons of ***Antarctosaurus*** have been found. Much of the information we have about *the* *creature* is guesswork based on the bones and parts of the skeleton discovered.
>
> ***Antarctosaurus*** means "not northern lizard." *This* *animal* belonged to the titanosaurids and was probably one of the largest dinosaurs. One thighbone was about 7.6 feet (2.3 meters) in length. (100 Dinosaurs)

As the extract illustrates, the choice to generalize and to use a general term depends on whether the mention is 'paragraph' initial or not: initial mention favours the specific term (*Antarctosaurus*), whereas second mention favours the move to a general term (*creature, animal*).

4.7 Conclusion

The brief exploration of interpersonal and textual lexis concludes the discussion of the abstract model. As I noted at the outset, there are various ways of implementing it. In conclusion, I will return to the current Nigel approach to lexis and lexical selection to indicate some ways in which it can be extended in the light of the abstract model.

Collocationally conditioned choice. Collocational lexical functions of the kind discussed in Section 4.5.2.1 (iii) might be represented by replacing the simple association between a concept and a lexical item with a more structured semantic subentry. The semantic subentry would be a pattern corresponding to a conceptual configuration. In the simple case, this pattern would simply be a particular concept. However, in the case of a collocationally conditioned lexical item, it would include a concept as well as information indicating relations to other concepts. For instance, the semantic subentry for *deeply* would include not only the concept of 'high degree' but also its relation as a filler of the degree role on processes of mental reaction (cf. Section II:4.5.3.1.1). If this approach is adopted, a semantic subentry need not correspond to a unique concept but can also be a conceptual pattern. Alternatively, unique concepts would have to be created for cases of collocational conditioning so as to create appropriate single-concept points of association.

Interpersonal lexis. A first step in the representation of interpersonal lexis could be to allow for interpersonally differentiated sets of lexical items to have the same subentry in the knowledge base. For instance, the members of pairs

such as *tiny* and *puny, newspaper* and *rag,* and *complain* and *whine* might associated with the same concepts, but be differentiated according to an interpersonal feature of disapproval. The process of lexical selection would then be able to filter the candidate lexical items according to interpersonal features such as disapproval, approval, polite, and colloquial. If these features could be given content elsewhere in the generation system, the lexical selection process could appeal to this information in selecting from the candidate sets.

Textual lexis. The algorithm for selecting lexical items could be expanded to take textual factors into consideration. A simple initial step would probably be to make it sensitive to taxonomic movements. For instance, to handle choices of the kind illustrated at the end of the previous section, the algorithm would (among other things) determine that the context was that of a mention following a paragraph-initial one. Having determined this, it would search upwards in the conceptual taxonomy for a lexical item belonging to the class of general nouns (*people, creature, stuff, idea,* etc.; Halliday & Hasan, 1976: 274 ff.). Another simple early step would be to make sensitive to lexical repetition, along the lines indicated by Granville (1983).

CHAPTER III:

SEMANTICS

1. Semantics as an interlevel

In Chapter II, I dealt with lexicogrammar in text generation. The next level in the move upward from lexicogrammar is semantics. The concern is the same as before, but instantiated for semantics: how can semantic theory be used in text generation; what kind of semantics do we need? The general answer is quite clear: we need a theory of semantics that provides the text generator with an **interface** between lexicogrammar and the 'environment', the rest of the generator, and this is essentially how systemic theory conceives of semantics (cf. Section I:1.2): systemic semantics is the interlevel between lexicogrammar and context.

Systemic functional semantics is one kind of functional semantics.[1] There are a number of characteristics of systemic functional semantics as it has been described by Halliday (1973, 1978, 1984); for example:

(i) semantics is an interlevel between lexicogrammar and semiotic systems above language;

[1] I will postpone the consideration of other kinds of semantics in relation to systemic semantics until I have characterized systemic semantics, so for the time being it will be helpful not to think of the role of semantics as the part of language concerned with the meanings of words and sentences or the part concerned with synonymy, antonymy, anomaly in meaning, tautology, and so on.

(ii) semantics has a full functional range -- ideational, interpersonal, and textual; it is not restricted to one metafunction and meaning is not confined to experiential or ideational meaning;[2]

(iii) the basic unit of semantic system -- and of the linguistic system in general -- is text, i.e. language functioning in context. Semantics is not restricted to the semantics of propositions or predications.

The third point will not be addressed in the bulk of this chapter since I will approach the semantic interlevel from below, from lexicogrammar, here and the units of semantics will thus be those that correspond to grammatical units. I will return to it in Section III:6.7.

1.1 Approaches to the interlevel

When we develop the semantic interface, we can take either of the two levels of organization to be interfaced as a starting point. That is, we can base the semantic interface on lexicogrammar or we can base it on context:

[2] This really follows from (i): the semantic interface of a multifunctional grammar will itself be multifunctional.

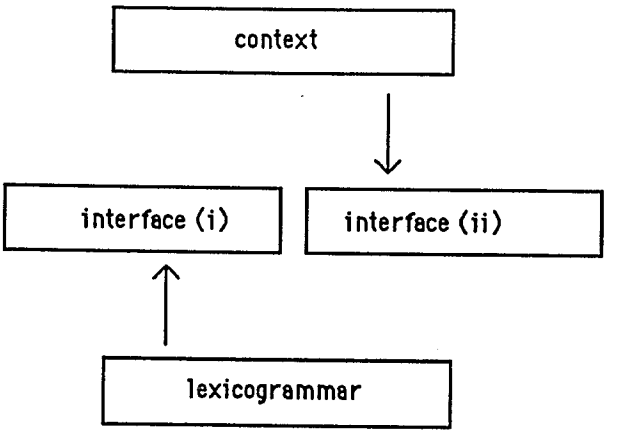


Fig. III:1-1: Approaches to the development of a semantic interface

The nature of the semantics will depend on whether our starting point is lexicogrammar or context of situation. The two major areas of variation are

(i) the nature of the organization of the semantics: does it reflect lexicogrammar or does it reflect context?

(ii) the nature of the semantic categories: are they semantic versions of grammatical categories or are they semantic versions of contextual categories?

The two movements in the design of a semantic interface are not mutually exclusive. The situation is the same as when we build a tunnel under the Alps: eventually the two movements towards each other will meet, we hope. Here I will focus on the grammar-based approach first. It is a stage in the grammar-based movement I outlined in the introduction. I will pick up the matter of context again below in Section III:6.

In a sense, linguistic semantics has always been essentially grammar-based. Semantics in traditional grammar is like that. A grammatical category is identified and then its significations and uses are listed. But since traditional grammar and systemic-functional grammar are different kinds of grammars, the semantices based on them will also differ. For example, while the semantics of traditional grammar is primarily word-based, a semantics based on systemic-functional grammar is clause-based and while the former is based on forms such as case and number, the latter is based on systems. Moreover, a functional grammar will encourage the development of a functional semantics. In the same way, it is possible to identify differences between a semantics based on systemic-functional grammar and a (formal) semantics based on a modern formal grammar. However, before discussing other approaches in Section III:7 below, I will present the current version of the semantic interface developed for Nigel (Sections III:1 & 2) and discuss possible revisions of it and extensions to it (Sections III:3, 4, 5 & 6).

1.2 Interface to lexicogrammar in Nigel: choosers & inquiries

The interface mechanism developed for the Nigel grammar is the so-called chooser and inquiry framework. As we have already seen briefly in Section II:1.2.1.5 and will see in more detail below, the interface between the Nigel grammar and the stratum above is guided by the organization of the grammatical system network and in this respect the interface is grammar-based and is thus organized from below rather than from above (in stratal terms). Grammar-based interfaces have been used before in generation, but they have been organized in terms of structural rules rather than system networks.[3] The

[3] See for example Simmons & Slocum (1972), who use an ATN and associate choice

system network approach used in Nigel gives more flexibility and independence of linear sequence, particularly in the separation of metafunctions.

1.3 Choosers and inquiries

Since the semantic interface is grammar-based and the main organizing principle in the grammar is the system, the semantic locus of organization is also the system. Each system in the grammar has a **chooser** (or choice expert) associated with it. A chooser consists of one or more **inquiries** like CommandQ.[4] It presents them one at a time to the stratum above the grammar. Based on the response to an inquiry, the chooser will either choose one of the features of its system or ask another inquiry if more information is needed to make an appropriate choice. The choosers thus use inquiries as an interface between context and lexicogrammar:

conditions with the arcs, and Sowa (1983b), who follows Heidorn (1972) in using an augmented phrase structure grammar, again with choice condition associated with syntagmatic rules (phrase structure rules augmented with conditions and actions). I will return to these other approaches below in Section III:8.

[4] Collectively, the choosers of the chooser and inquiry interface do some of the work of Fawcett's (1973; 1980; 1984) problem solver.

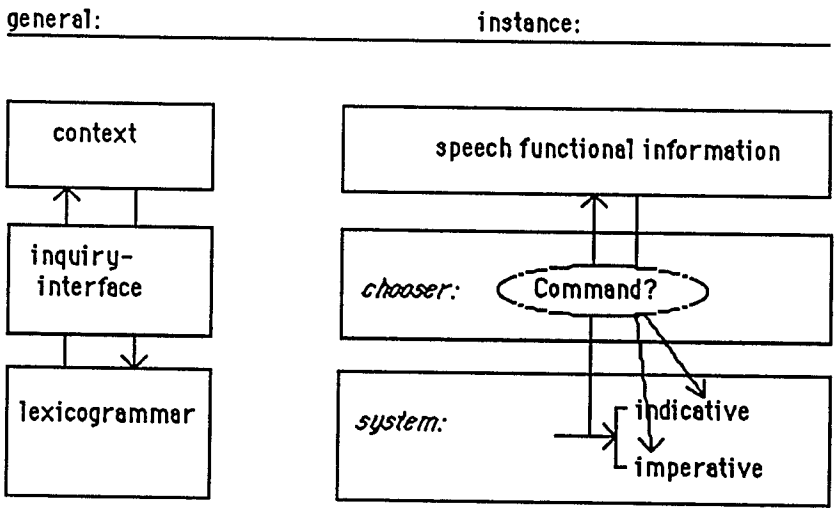


Fig. III:1-2: Inquiry interface

For example, in order to choose between indicative and imperative in the MOOD TYPE system (indicative / imperative), the chooser of the system uses the inquiry CommandQ, which can be stated discursively as follows:

> Is the speech function MOOD a command or not, i.e., does it constitute a demand from somebody for goods or services?
>
> (COMMAND, NON-COMMAND)

There are two responses, "command", in which case the grammatical feature imperative is chosen, and "not command", in which case indicative is chosen. These two responses form a closed set and constitute branching alternatives. Inquiries with a closed set of branching alternative responses are **branching inquiries.** The capitalized item in the inquiry, MOOD, is a variable which has a

specific value in the generation of any given example. The value of an inquiry variable is identified by means of an **indentifying inquiry**. The response to an indentifying inquiry is whatever is appropriate in a given context of generation; it is not drawn from a closed set of alternatives. For example, the identifying inquiry MoodID is used to identify a value for MOOD.

> MoodID: What is the speech functional component of the proposition or proposal ONUS?

(The prior identification of ONUS is presupposed.) The response is called a **hub** and is associated with the relevant variable, which is MOOD in the example. This can be represented as (MoodID ONUS) -> MOOD. A given message will have its own unique associations with MOOD and other variables. The associations between variables such as MOOD and their hub values established by identifying inquiries are recorded in the **Function Association Table.** The response to each new identifying inquiry is thus added to this table as the system network is traversed and choosers are activated during generation.

The variables used in inquiries and identified by identifying inquiries are typically grammatical functions such as Mood, Actor, and Theme. The inquiry interface thus relies on the functional conception of structure (as opposed to syntagms; cf. Section II:2.3) to establish hub associations. For instance, the various transitivity functions have corresponding identifying inquiries such as ActorID, GoalID, SenserID, and PhenomenonID.

There are, then, two types of inquiries, branching inquiries, such as CommandQ, with a predefined set of alternative responses and identifying inquiries, such as MoodID, used to provide variables with values.

The inquiry CommandQ was stated discursively above as an English question. That has proved to be a useful way of specifying what an inquiry is intended to cover. However, in the running Penman system, inquiries have formal implementations so as to be able to interact with the environment. For example, inquiries like QuestionQ and CommandQ address speech act operators that scope over logical forms specifying information to be expressed. Nebel & Sondheimer (1986) discuss the implementation of inquiries.

1.4 Inquiry responses as choice conditions

The closed set of responses to an inquiry put to the environment above the grammar can be seen as a **choice condition**. A grammatical feature in a system is chosen if one or more choice conditions have been satisfied. These choice conditions concern information in the environment of the Nigel component -- information from the knowledge base, for example.[5] As an example, consider again the system MOOD TYPE: indicative / imperative. The choice condition for the choice of the feature imperative is 'command':

[5] The choice conditions are comparable to Fawcett's (1984: 166; 1983: section 3.2) procedural felicity conditions.

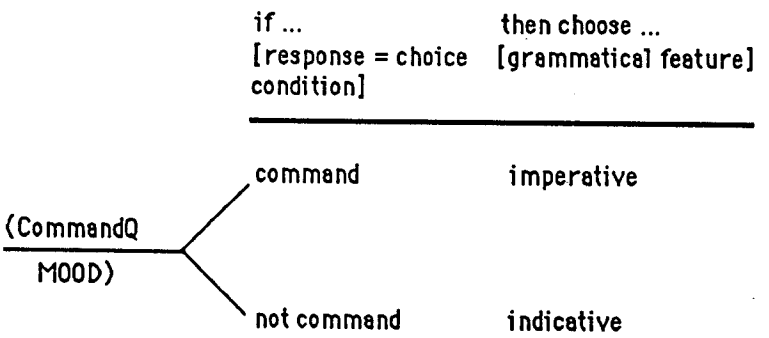


Fig. III:1-3: Inquiry responses as choice conditions

1.5 Inquiries and systems

Branching inquiries are clearly similar to systems; both represent an opposition. Apart from the fact that inquiries do not have the entry conditions of systems (cf. Section III:2.2 below), there are two related differences. Inquiries are explicitly directed upwards: the orientation upwards is embodied in the question. Further, inquiries are parameterized whereas systems are not. For instance, CommandQ has the parameter MOOD in the example above -- (CommandQ MOOD) but the system representing this opposition would not be: command / not command. We can think of this aspect of the difference between inquiries and systems as comparable to the difference between semantic features (components) with and without parameters. This suggests that there is an alternative conception based on an extension of the traditional system: a system whose terms (output features) have parameters; for example:

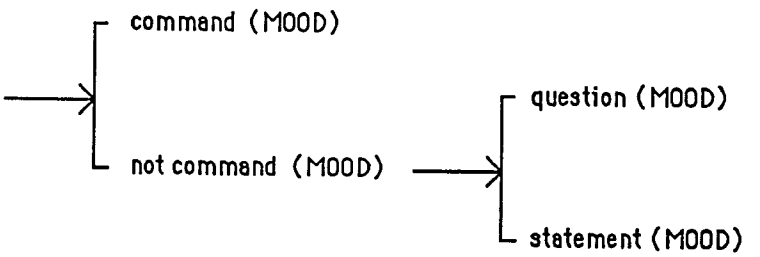


Fig. III:1-4: Systems with parameterized terms

Using a semantic system with parameterized terms would entail checking to see whether a term applies to its parameter in the environment.

1.6 Organization of inquiries

In the current version of Nigel, inquiries are organized locally into choosers, one for each system in the grammatical system network. There is no additional global organization of inquiries within the semantic interface; global organization only exists at the grammatical level, embodied in the grammatical system network.

1.6.1 The local organization of inquiries: choosers

A chooser is essentially a decision tree, more specifically a tree of branching inquiries. For instance, a chooser may consist of a single branching inquiry such as CommandQ. Choosers will be discussed in more detail in Section III:2.

1.6.2 Global organization according to the system network

As we have seen, inquiries within a chooser are organized into a decision tree. However, inquiries from the choosers of different systems are not explicitly related in anything like a supra-chooser tree or network of inquiries in the present articulation of the framework. In other words, there is no global organization of inquiries, no organization beyond the chooser local to a system.

Once a system in the grammatical system network has been reached, its chooser controls what happens, but outside of choosers the control resides with the grammar -- cf. Sections II:1.2.1.5 and II:1.2.1.6. The grammatical system network determines the order in which systems are reached unless they are simultaneous, in which case the entry order is arbitrary, in principle. Consequently, the grammatical system network also determines when a particular chooser is activated and starts presenting inquiries. This can be illustrated for the MOOD region of the clause grammar; see Figure III:1-5 below.

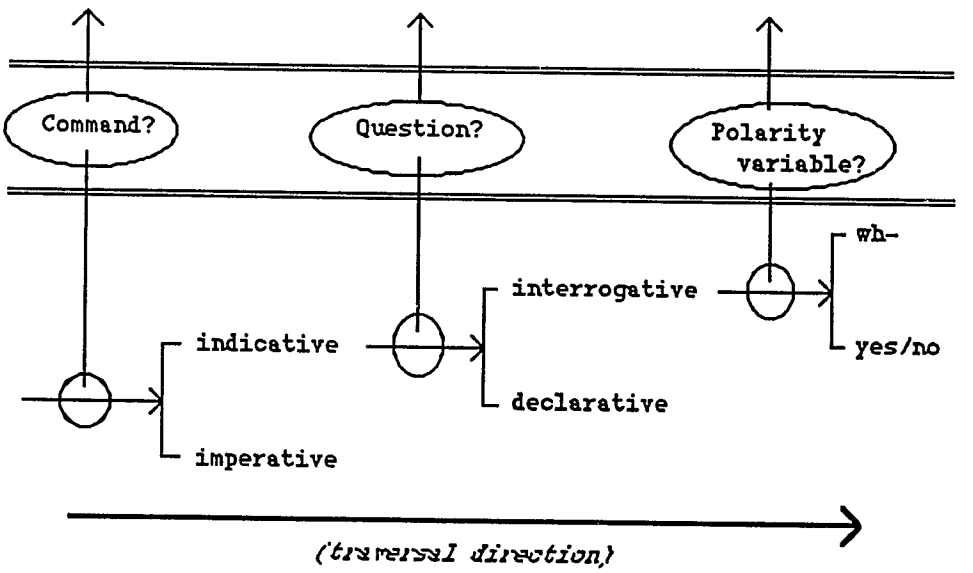


Fig. III:1-5: Traversal of system network and chooser activation

The grammatical system network is traversed from left to right in the order of increasing delicacy. Each time a new system is reached, its chooser is activated. The chooser presents an inquiry to the environment above the grammar and then it acts on the response.

To sum up, inquiries are organized locally into choosers, but there is no independent global organization of the inquiries over and above the individual choosers. The chooser design has the advantage that it defines a very simple control mechanism, which can be added to the already existing system network: choosers are simply associated with systems in the system network. Furthermore, as we saw in Section II:1.2.1.6, it can easily be folded into the grammar-based generation algorithm: a chooser is simply activated when its

system has been entered and its job is done when it has chosen a feature from the system it is associated with.

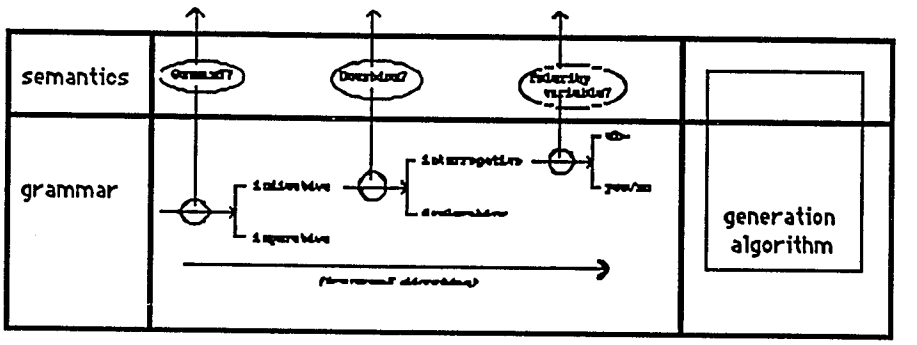


Fig. III:1-6: Chooser & inquiry interface and generation algorithm

This simple chooser design works up to a point but there are problems which will be discussed in Section III:3. These problems are partly due to the assumption of paradigmatic 'compositionality' the chooser framework is implicitly based on: the statement of meaning can be composed according to the systems of the grammatical system network, so each can be given its own chooser.

1.7 Demands on the environment

The adoption of the Nigel inquiry interface means that the environment has to be organized in such a way that it can meet the demands for information embodied in the collection of inquiries. For example, the environment must be able to control the use of speech functions to respond to the inquiries in Figure

III:1-5 above, Command?, Question? etc.. And if there is an inquiry which asks whether a particular referent can be assumed to be identifiable to the reader, the environment must have some kind of reader model to respond correctly. Similarly, to respond to tense inquiries, the environment must have a model of serial time. There are a great many specific demands like these. If we consider the general functional organization of the lexicogrammar, we can assume that each functional component will need a particular kind of information. We can represent this assumption by positing a base or source of information for each metafunction. Ideational inquiries are answered by consultation with the **ideation base**, interpersonal inquiries by consultation with the **interaction base**, and textual inquiries by consultation with the **text base**, as diagrammed below.

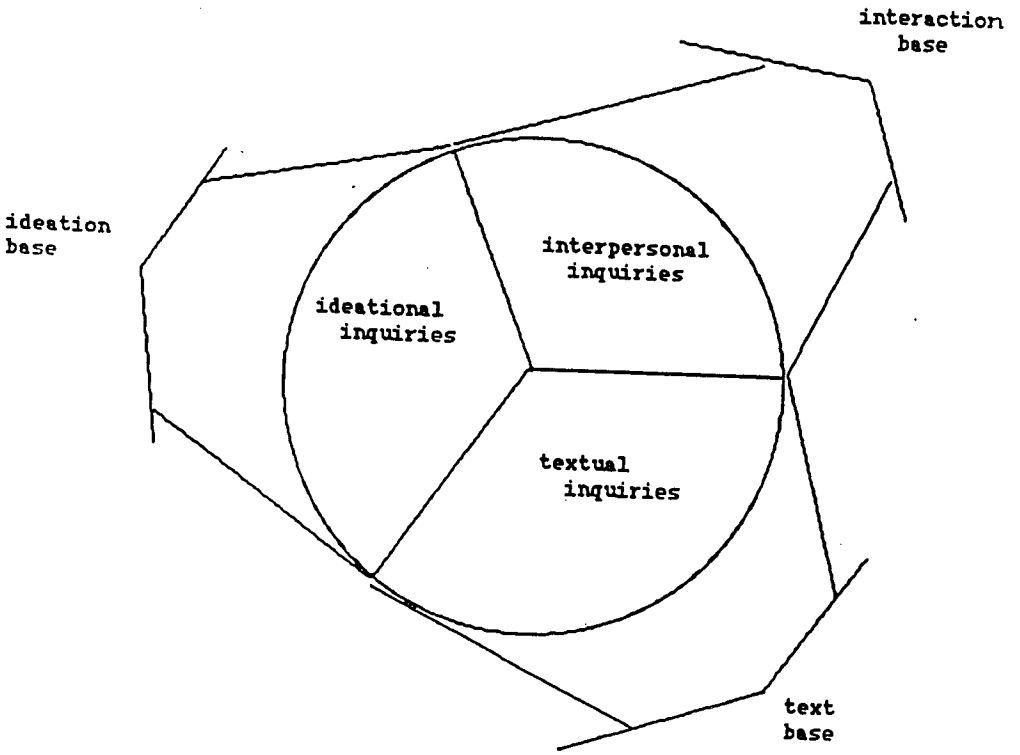


Fig. III:1-7: Environmental support of inquiries

The three bases are the topic of Chapter IV. (The ideation base corresponds roughly to what is usually called the knowledge base of a text generator.)

Through the inquiries we can project organization onto the environment. At the same time, the inquiry interface insulates Nigel from the particular knowledge representation *formalism* used in any version of a text generator and this is a practical design advantage, since knowledge representation has not achieved a stable and mature state yet but is likely to change. Since Nigel is insulated from the environment, environmental information can be represented

by means of different kinds of formalisms as long as appropriate responses can be given to Nigel's inquiries.

Having introduced the general outlines of the chooser and inquiry interface, I will now discuss it in more detail.

2. Organization of inquiries (1): chooser trees

In this section, I will illustrate what can be handled by means of the chooser tree organization of inquiries; I will stay with the basic chooser of the current Nigel interface. Then, in Section 3, I will turn to insufficiencies in the chooser organization, the first step in my exploration of revisions of and extensions to the interface.

2.1 The chooser

A chooser can be thought as partly representing the following working hypothesis about the organization of inquiries:

(i) inquiries are organized into decision (discrimination) trees; and
(ii) these decision trees are local to each system in the system network.

As an illustration of a simple chooser, let's consider the MOOD TYPE chooser, the first chooser of the MOOD part of the clause network diagrammed above (Figure III:1-5). It uses the branching inquiry CommandQ to obtain the

information needed to choose between indicative and imperative.

The MOOD TYPE chooser contains only this branching inquiry, since it fully determines the possible choices in the system.[6] If the response is COMMAND, the feature imperative is chosen, and if the response is NON-COMMAND, the feature indicative is chosen. Abbreviating the inquiry as (CommandQ MOOD), we can represent the chooser as follows.

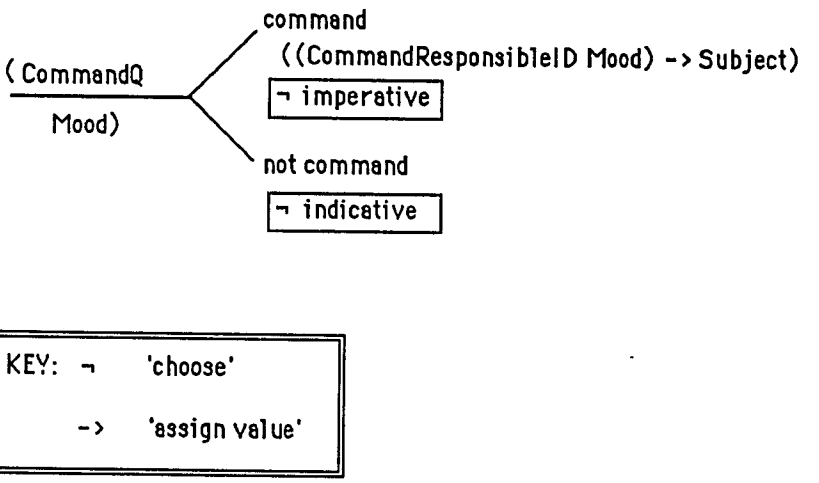


Fig. III:2-1: The organization of a chooser

If the response is 'command', the variable Subject is identified with the response to (CommandResponsibleID Mood) and the grammatical feature imperative is chosen. If the response is 'not command', the feature indicative is chosen.

[6] The chooser would be more complex if it was intended to handle interpersonal metaphors of mood (Section II:3.3), such as commands expressed as questions. I will only discuss congruent cases in this section and will return to metaphorical ones below.

The inquiry CommandResponsibleID is an identifying inquiry and does not affect the decision tree organization of the chooser. Identifying inquiries can occur after a response to a branching inquiry, as in the example, and they can also occur before a branching inquiry is asked. The inquiry CommandResponsibleID serves to give a value to Subject when the response to CommandQ is COMMAND (i.e., in imperative clauses):

> What entity is specified as responsible for the realization of the process being commanded by MOOD?

For instance, in the environmental representation of a clause such as *Wash the asparagus carefully,* the addressee would be identified as being responsible for the realization of the process of washing.

We see then that a chooser is organized as a decision tree. The branching points are defined by branching inquiries and the branches by the responses. In addition, a chooser may contain identifying inquiries, occurring before the root of a chooser or embedded under a response branch, and it contains a realization statement, a choose statement, embedded under each terminal branch.[7]

Although most choosers use inquiries to obtain the information needed to make a principled choice, there are choosers without inquiries. They consist of

[7] More accurately, each path through the chooser tree has to lead to a choice in the system of the chooser or else the generation process could not run to completion. In addition to the chooser organization mentioned here, there are other chooser operators, notably Pledge; see Mann (1983). Chooser operators are used to present the two types of inquiry: Ask + branching inquiry; and Identify + identifying inquiry. Since they do not affect the organization of choosers or inquiries, I have chosen to regard them as aspects of the implementation of the chooser and inquiry framework.

only a choose operator. This choose operator is different from the normal one in that it can be overruled by a preselection within the grammar without a resulting conflict. It is called **DefaultChoose** and is used to specify the feature to be chosen in a system when there is no preselection to identify the feature to be chosen. DefaultChoose is thus a way of specifying a feature as the unmarked or default choice. For example, the chooser of the system PRONOUN CASE is "(DefaultChoose oblique)", which means that the feature oblique is chosen unless a preselection provides the reason for another choice.

The possible components of a chooser are summarized in the table below.

<table>
<tr><td rowspan="2">branching</td><td rowspan="2">branch</td><td>branching inquiry</td><td rowspan="3">inquiry (upwards)</td></tr>
<tr><td>identifying inquiry</td></tr>
<tr><td rowspan="3">non-branching</td><td rowspan="2">identify</td><td></td></tr>
<tr><td rowspan="2">choose</td><td>Choose</td><td rowspan="2">realization (downwards)</td></tr>
<tr><td>DefaultChoose</td></tr>
</table>

Fig. III:2-2: Chooser components

2.2 A multi-inquiry chooser; inquiry presentation conditions

The minimal chooser of a system (as opposed to a gate) consists of one branching inquiry. The chooser of MOOD TYPE is a simple one with only one branching inquiry, as was illustrated in Figure III:2-1. The next two systems in the network after MOOD TYPE are DEICTICITY and PRIMARY TENSE:

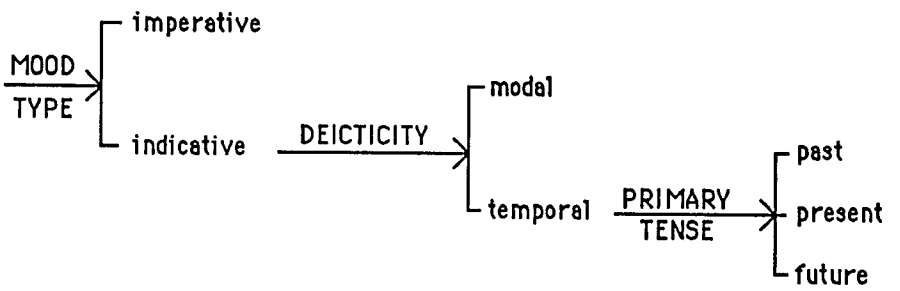


Fig. III:2-3: Three systems

The chooser of DEICTICITY has one branching inquiry just like the MOOD TYPE chooser. It asks whether a modality is to be expressed or not; I will return to it presently. The chooser of PRIMARY TENSE is more complex than the MOOD TYPE and DEICTICITY choosers in that it contains several branching inquiries. The selection of one of the PRIMARY TENSE features expresses the temporal relation between two times, t_0 and t_1, the first of which is 'now', the time of speaking. The second may or may not be the time of the occurrence of the Process of the clause, depending on whether a secondary tense has been selected or not.

If t_1 temporally precedes t_0, the feature past is chosen:

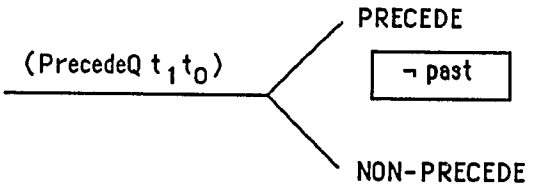


Fig. III:2-4: The first inquiry in the PRIMARY TENSE chooser

If t_1 does not precede t_0, i.e., if the response is NON-PRECEDE, an additional inquiry, ConditionQ, is presented. We can say that this second inquiry is dependent upon (embedded under) the NON-PRECEDE response from the first inquiry; it is only asked under the condition that NON-PRECEDE is the response. NON-PRECEDE is the **inquiry presentation condition** for the second embedded inquiry. We can think of it as comparable to a simplex, single-feature entry condition of a grammatical system. However, there is a significant difference. In a system, the entry condition is part of the definition of the system itself. In contrast, the inquiry presentation condition of an inquiry is not part of its definition but is represented by its place of embedding in a chooser. Thus, in the current formulation, ConditionQ does not itself have an inquiry presentation condition, but in the PRIMARY TENSE chooser it has the presentation condition NON-PRECEDE since it is embedded under that response in the chooser tree. We will see that the difference between the two types of condition is significant when we explore the possibility of complex presentation conditions (see Sections III:2.2 and III:5.1).

ConditionQ has two responses, the choice depending on whether a logical / temporal condition is being expressed or not:

ConditionQ:

Does the situation to be expressed constitute a logical or temporal condition on some other process in the text to which it is rhetorically related, i.e., does it set up -- logically or temporally -- the possible world in which this other process occurs?

(CONDITION, NON-CONDITION)

If a condition is being expressed (e.g. in a *when*-clause or an *if*-clause), the feature present is selected (as in, *When he gets a new job, we will all celebrate*). In other words, in the context of CONDITION, no further temporal distinctions are made.[8] If no condition is being expressed, a further temporal distinction must be made. PrecedeQ is used again, this time with the parameters reversed: (PrecedeQ t_0 t_1).The positive response to this third inquiry, PRECEDE, leads to the selection of the feature future. The response leads to the choice of the feature present. The assumption is that the choice condition for the feature present is that no precedence relation holds between t_0 and t_1 and at this point in the chooser this information has been obtained, since PrecedeQ has been presented twice. This illustrates the importance of inquiry presentations conditions *within* a chooser: they represent the current state of knowledge when an inquiry is presented. The PRIMARY TENSE chooser is summarized below.

[8] This is not an absolute rule. We find examples such as *It'll take me an hour before I'll know* (AE, spoken); see Close (1979) for examples in conditional dependent clauses.

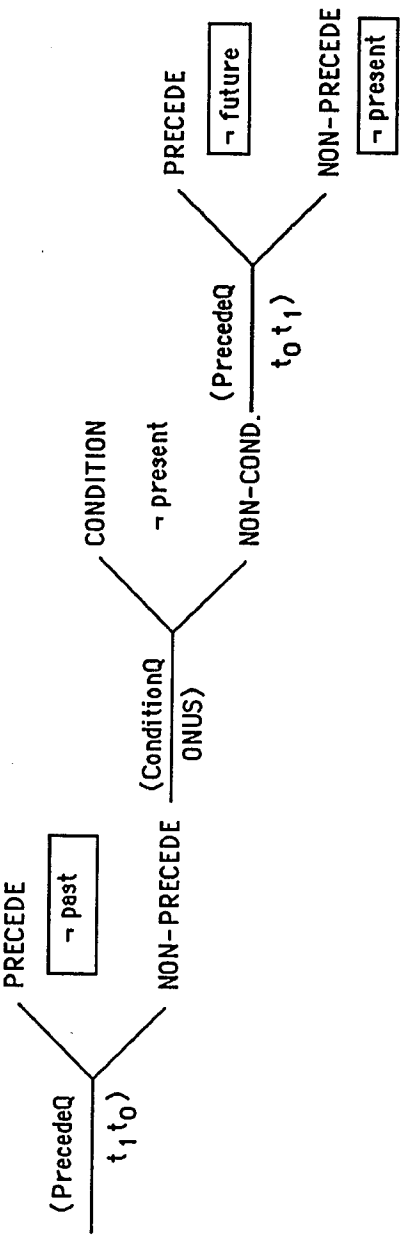


Fig. III:2-5: The chooser of PRIMARY TENSE

The fact that (PrecedeQ t_1 t_0) is the first inquiry about precedence is significant. It means that the reason for choosing the feature past is unaffected by the further distinctions made in the chooser. In contrast, the reasons for choosing present and future are not.

2.3 Simulating complex inquiry presentation conditions

As the PRIMARY TENSE chooser illustrates, all branching inquiries except for the one that constitutes the root of the chooser tree are embedded under the response to another branching inquiry. That response constitutes the condition under which the inquiry is presented -- what I called its presentation condition. Since an inquiry can only be embedded under a single response, an inquiry presentation condition is always a single response. There are no complex inquiry presentation conditions in the present version of the inquiry framework. In other words, there can be no conjunction or disjunction of branches before an inquiry is presented. In addition, since a chooser is a tree, there cannot be any simultaneous inquiries. However, simultaneous inquiries, conjunctive presentation conditions, and disjunctive ones can be simulated in the inquiry tree, which I will illustrate below:

(i) simultaneity: simulation by depth in the chooser tree;
(ii) conjunction: simulation by depth in the chooser tree; and
(iii) disjunction: simulation by repetition of inquiry in chooser tree.

(i) Simultaneity can be simulated by depth in the chooser tree: an inquiry is embedded under each response to another inquiry instead of being

simultaneous with it. For example, consider the inquiry CommandQ again. It mentions two parameters of the notion of command, (i) demanding; and (ii) goods & services:

> Is the speech function MOOD a command or not, i.e., does it constitute (i) a demand from somebody (ii) for goods & services?

In this respect, the inquiry follows Halliday's (1984; 1985) interpretation of the traditional speech functional categories command, offer, statement, and question in terms of an exchange between speaker and listener:[9] (i) the role adopted by the speaker and assigned to the listener in the exchange: is the speaker demanding or giving?; and (ii) the nature of the commodity exchanged: is information or goods & services being exchanged? --

	INFORMATION	GOODS & SERVICES
GIVING	'statement'	'offer'
DEMANDING	'question'	'command'

Fig. III:2-6: Speech functions as intersections of two parameters

There are good semantic reasons for analyzing the speech functions statement, question etc. into the two simultaneous parameters. If we wanted to decompose CommandQ into two simultaneous inquiries, one concerned with

[9] The exchange is, of course, symbolic. The central point is that it is interaction.

the distinction between giving and demanding a commodity and one concerned with the nature of the commodity, we would ideally set them up as simultaneous inquiries in the chooser:

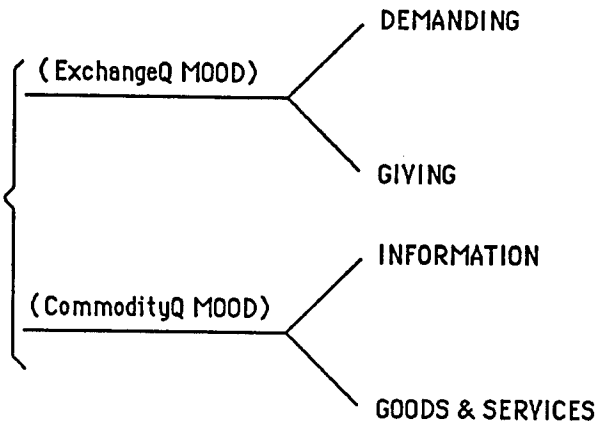


Fig. III:2-7: Hypothetical chooser with simultaneous inquiries

However, in the present version of the chooser framework, we have to embed one inquiry under the other:

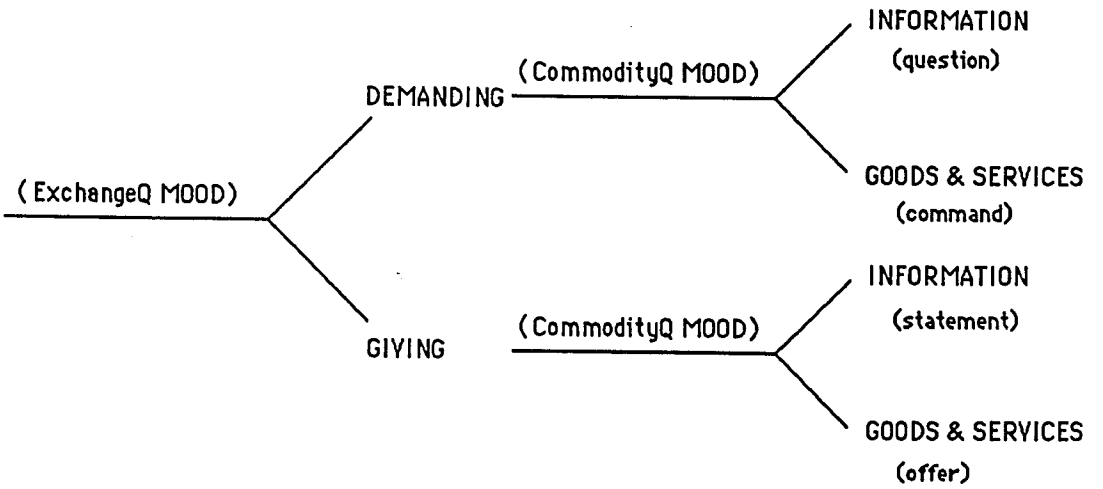


Fig. III:2-8: Simultaneity simulated by embedding

(ii) Conjunctive inquiry presentation conditions. When ExchangeQ and CommodityQ are simultaneous, the combination of 'giving' and 'demanding' define the category of statement. If we wanted to present an inquiry concerned with statements, such as AgreementRequestQ,[10] we would need a conjunctive entry presentation condition:

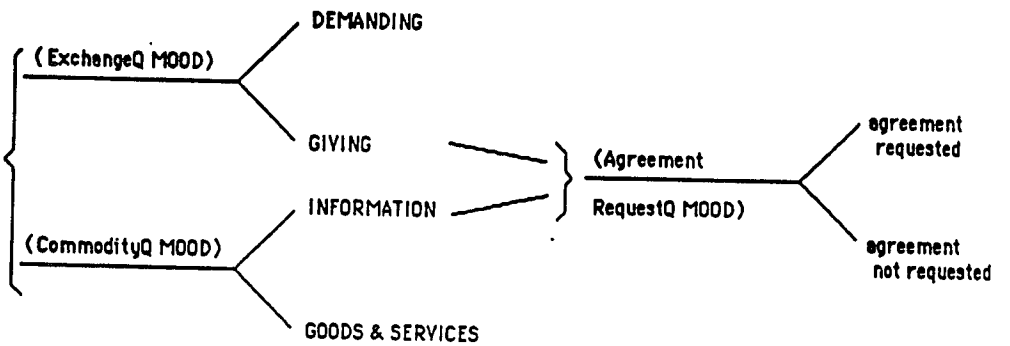


Fig. III:2-9: Conjunctive inquiry presentation condition

Since conjunctive inquiry presentation conditions do not exist, we have to simulate the conjunction of 'giving' and 'information'. To do this, we simply abolish the simultaneity as before; i.e., we embed one of the inquiries that provides one of the responses in the conjunct under the other conjunct. Once the simultaneity has been simulated by means of embedding, the conjunctive entry condition can also be simulated by means of embedding. Since CommodityQ has been embedded under the branch 'giving', its 'information'

[10] This inquiry is used to ascertain whether the listener's expression of agreement with the speaker's statement is to be requested. A positive response leads to the selection of a (declarative) tag in the grammar: *it'll take a long time, won't it* and so on. Only the unmarked case of polarity reversal in the tag is covered (contrast: *it'll take a long time, will it*); additional options are available if we take tone selection in speech into account: cf. Halliday (1967) on British English. However, these additional resources do not affect the point of illustration here.

branch represents the complex category of statement and can serve as the presentation condition for AgreementRequestQ:

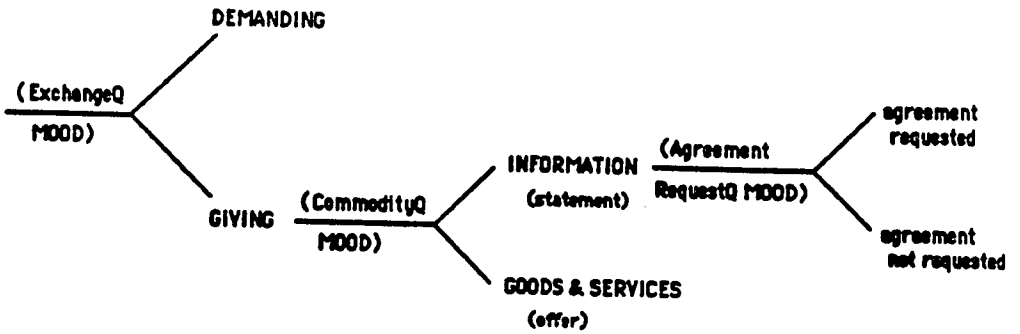


Fig. III:2-10: Conjunctive presentation condition by embedding

(iii) Disjunctive inquiry presentation conditions can be simulated by presenting an inquiry embedded under each disjunct. For instance, the choice in the system AGENCY between middle and effective depends on the process type. If the process is material or mental, the inquiry AgencyQ is used. It ascertains whether a cause external to the combination of Process and Medium is to be represented or not. We reflect the fact that it is used for material and mental processes by making these disjuncts in the presentation condition for AgencyQ:

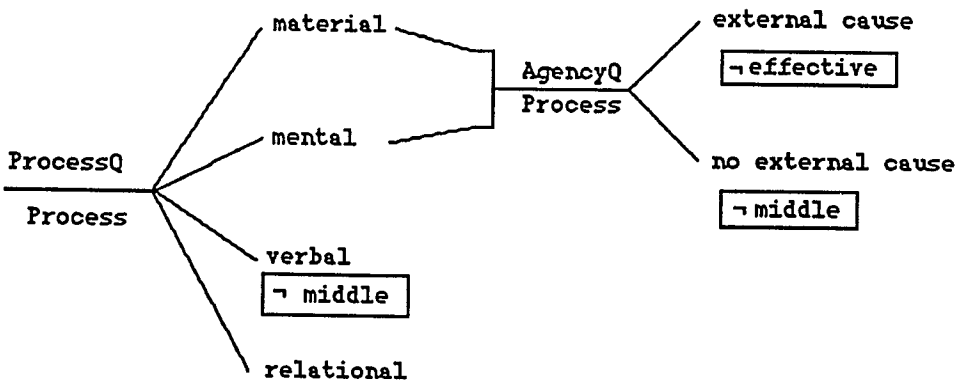


Fig. III:2-11: Disjunctive presentation condition

This disjunction has to be simulated by embedding AgencyQ under both 'material' and 'mental':

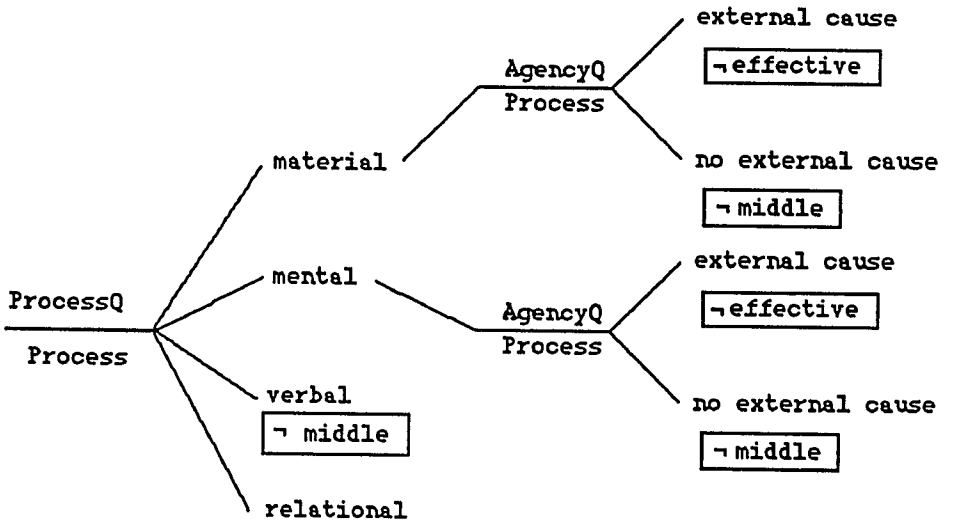


Fig. III:2-12: Disjunctive presentation condition simulated

After this brief consideration of how to represent relations among inquiries within a chooser, I will now turn to the inter-stratal relations between a chooser and its systems.

2.4 Diversification between chooser and system

In the simple case, there is a one-to-one relation between an inquiry response in a chooser and the choice of a particular grammatical feature. For example, in the version of the MOOD TYPE chooser given in Section III:1.2, COMMAND corresponds to imperative and NON-COMMAND corresponds to indicative. However, the correspondence between inquiry responses and features may be more complex. Following Lamb (e.g. 1971), we can recognize the following complex interstratal correspondences and apply them to the chooser and inquiry framework:

(i) diversification: the same inquiry response would be realized by a disjunction of grammatical features.

(ii) neutralization: different inquiry responses are realized by the same grammatical feature.

(iii) portmanteau realization: more than one inquiry response is realized by one grammatical feature.

(iv) composite realization: one inquiry response is realized by more than one grammatical feature.

With the exception of diversification, these cases all occur in Nigel.

(i) Diversification does not occur in Nigel. The working assumption is that all systemic alternations in the grammar are meaningful and should be distinguished by means of one or more branching inquiries.[11]

(ii) Neutralization can be illustrated by the chooser of PRIMARY TENSE: there are two 'paths' in the chooser leading to the choice of the feature present, representing two alternative choice conditions for choosing it. The disjunction of choice conditions is not represented explicitly in the chooser but it can be inferred from the repetition of the choice statement "¬ present" in the chooser given in Section III:2.1.

Another example of neutralization comes from the chooser of the system POLARITY. The feature negative is chosen over positive either (i) because the value of the polarity of the clause is negative or (ii) because the speaker's expectation is that the value of the polarity is positive (cf. Section II:3.2.5). The second occurs in the context of a yes / no question; in other words, when the value of the polarity is a variable whose value is to be supplied by the listener. When the speaker has no biased expectation, the feature positive is chosen:

A: `Have you ever heard him?`

B: `No, I haven't.` (CEC: 164)

When the speaker wants to express a positive bias, the feature negative is chosen, as in the following two examples said with a falling tone (tone 1 in

[11] As was noted earlier in Section 1.2, certain choosers do not use branching inquiries but only contain a 'default choose'.

Halliday's (1967) description; realizes an 'assertive' question):

A: It always seemed to be rather odd -- I don't know how old he was but probably getting on, you know, I mean, sort of fortyish -- he should go on playing cricket and play matches with undergraduates and be apparently completely inhuman.

B: //1 Yes. // 1 *Isn't this* funny. // 1 They all have their peculiar // little quirks of humanity. Yes. (CEC: 170)

A: // 1 I think isn't vitamin D // 1 the vitamin you get from the * sun *? //

B: // 1 * sun * // 1 That's right,// 1 yes.// ...(CEC: 598)

In the chooser of POLARITY, an inquiry that determines whether the value of the polarity is variable or not is presented and its two responses are followed by two different inquiries designed to obtain the information needed to make the appropriate polarity choice:

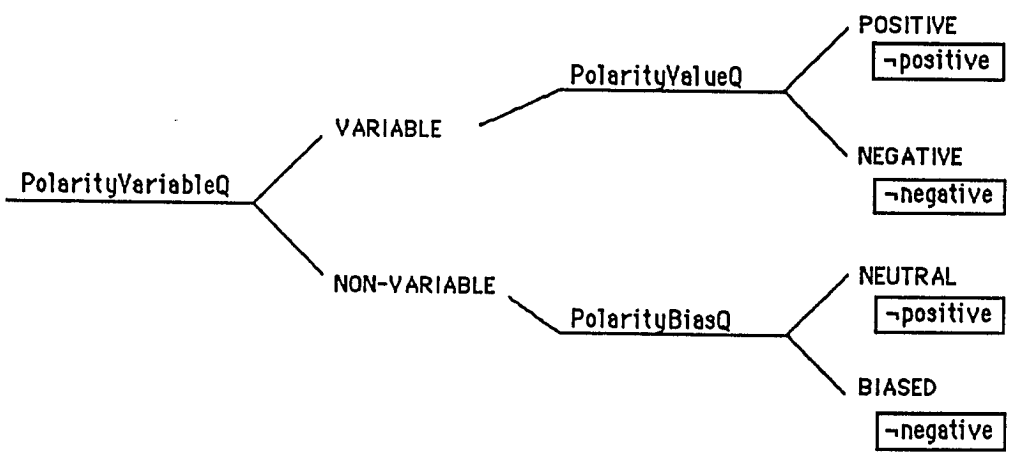


Fig. III:2-13: The chooser of POLARITY

In this chooser, negative is chosen either if the response is NEGATIVE or if it is BIASED; similarly, positive results from either POSITIVE or NEUTRAL.

The neutralization is represented in the POLARITY chooser above by stating the choice of the polarity features twice. A left-facing disjunction would allow a more direct representation of the neutralization:

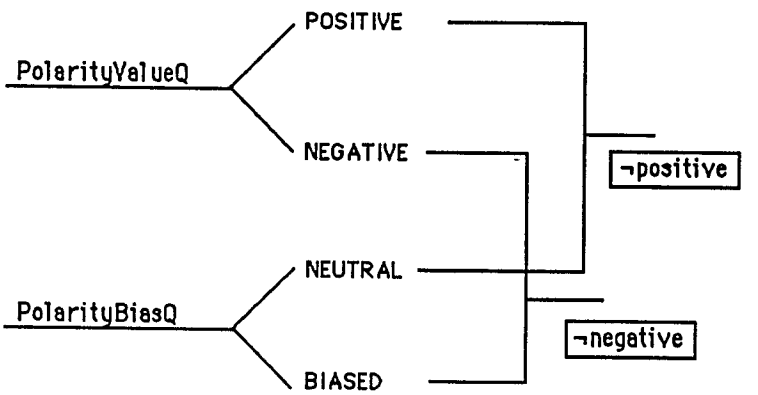


Fig. III:2-14 : Neutralization and left-facing disjunction

In principle, this left-facing disjunction is part of the logic of realizing branching responses, not of the logic of branching inquiries themselves.

(iii) Portmanteau realization can be illustrated with the revised MOOD TYPE chooser discussed in Section III:2.3. The feature imperative is chosen after two responses, viz. DEMANDING and then GOODS & SERVICES.

If we wanted to show portmanteau realization more directly than in the revised MOOD TYPE chooser, we would have to allow for simultaneous inquiries and for left-facing conjunction:[12]

[12] The category of offer (giving + goods & services) is not represented in the diagram. The choose statements refer to features from more than one system (¬ declarative in INDICATIVE TYPE, ¬ imperative in MOOD TYPE, etc.): see further below.

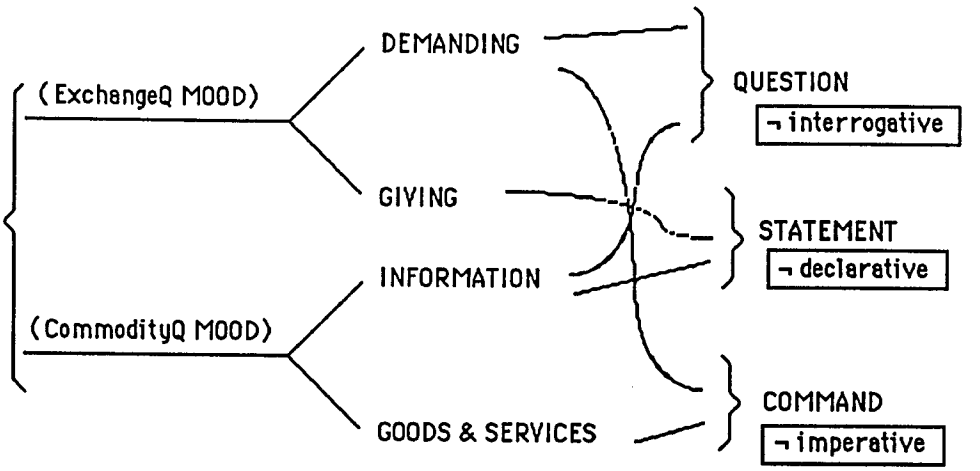


Fig. III:2-15: Portmanteau realization with conjunction

(iv) Composite realization is one way of handling agreement in the Nigel grammar. For example, to ensure number agreement between Subject and Finite, the inquiry PluralityQ can be asked twice, in two different choosers (cf. Section II:3.2.5). The first time it is asked in the chooser of SUBJECT NUMBER in the clause of the Subject. The number of Finite is specified according to the response. Later, as the Subject nominal group is developed, PluralityQ is presented again and the number of the nominal group is specified according to the response. As long as PluralityQ is asked of the same entity both times, the identity of the responses is ensured:

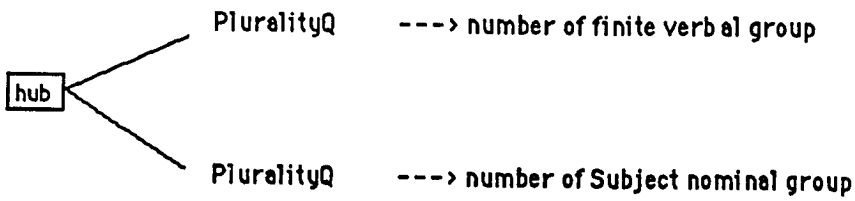


Fig. III:2-16: Agreement through consistency in environment

To summarize, the different types of diversification between chooser and system are tabulated below in terms of the categories identified by Lamb.

interstratal relation	in strat. theory	chooser & inquiry framework
diversification	downward or	---
neutralization	upward or	repeated Choose statements
portmanteau realization	upward and	succession of inquiries followed by one Choose statement
composite realization	downward and	same inquiry used in more than one chooser leading to more than one choice

Fig. III:2-17: Handling interstratal relations

3. Inquiry organization (2): insufficiency of choosers

We have already seen that the inquiries *within* a given chooser should ideally be organized as a little network of inquiries rather than as a decision tree: in addition to being simple responses, inquiry presentation conditions may be either conjunctions or disjunctions of responses but these complex conditions have to be simulated at present in the organization of an inquiry tree. In this section, I will take one step further and will show that there are good reasons to abandon the local chooser packaging of inquiries and to allow a network of inquiries that is more global than are choosers. It is useful to think of the reorganization of inquiries from simple discrimination net in chooser packages in three steps:

(i) Choosers are retained, but conjunction and disjunction are used within choosers (cf. Figures III:2-7 and III:2-11 above).

(ii) Choosers are abandoned and inquiries are organized into one global inquiry network.

(iii) In addition to (ii), the inquiry interface is allowed to refer to more than one traversal of the grammar.

Step (i) was mentioned in the previous section. While this first step is of some interest, it is really the next two steps that can affect the basic nature of the inquiry interface, since they make it less grammar-dependent. I will now discuss step (ii) and will postpone the discussion of step (iii) until Section III:5.

There are three kinds of reasons for considering inquiry organization beyond the chooser.

(i) Reasons within the inquiry stratum itself: inquiry interdependencies, discussed in Section III:3.1.

(ii) Reasons from below, i.e., from the lexicogrammatical stratum: the need to work with more than one system at the same time, discussed in Section III:3.2.

(iii) Reasons from above, i.e., from the context: for example, if we want to create an interface for a particular context of situation, this interface will not be organized according to the general grammar -- Sections III:3.3 and III:6.

3.1 Considerations from within: inquiry inter-dependencies beyond the chooser tree

Beyond the single chooser the only inquiry organization is the indirect ordering of choosers because of their association with systems in the grammatical system network. That is, while choosers or inquiries do not themselves form a global semantic network the systems the choosers are associated with do. There are two ways in which the ordering of systems may support inquiry interdependencies:

(i) Because of the delicacy ordering of systems, hub associations established in the choosers of less delicate systems will be available to inquiries in the choosers of dependent more delicate systems.

(ii) Since inquiry responses lead to choices of grammatical features, an inquiry response may be 'recorded' grammatically beyond the chooser in which the inquiry is presented. Consequently, the choosers of dependent, more delicate systems may be able to assume this information and thus not have to rediscover it.

I will discuss these two observations in more detail presently. However, we can note here that both of them involve the partial ordering of systems along the scale of delicacy. The system network will not support any inquiry interdependencies between choosers of systems that are not ordered with respect to one another. In other words, there will not be any support when systems belong to different simultaneous parts of the network. For example, MOOD systems and TRANSITIVITY systems are never ordered with respect to one another. Since MOOD and TRANSITIVITY belong to different metafunctions, we expect them to be independent of one another both at the grammatical level and the chooser and inquiry level. However, we also find simultaneous systems within the same metafunction. For example, MOOD and POLARITY, both of which are interpersonal, are simultaneous regions in the grammar. Since metafunctions are reflected in greater systemic interdependency within the grammatical system network, it is reasonable to expect the same phenomenon at the chooser and inquiry level (cf. Section II:3.2.5 on MOOD and POLARITY). We can state this expectation in the form of the following hypothesis about inquiry interdependencies:

The chooser package decision tree organization of inquiries will work as long as the grammatical system network reflects metafunctional interdependencies. When metafunctional interdependencies are not

reflected in the grammatical system network, we may need to revise the chooser organization of inquiries to represent semantic interdependencies within one metafunction.

I will now explore inquiry interdependencies in some more detail.

3.1.1 Identifying inquiries: hubs and hub-flow

Often inquiries in two or more different choosers use the same parameter with the same hub association. In such cases, the inquiries can rely on a single identification of the hub. However, that identification must be performed before the inquiries relying on it are reached. The need to identify a hub before it is used in an inquiry creates interdependencies among choosers. For example, the chooser of MOOD TYPE (in Figure III:2-1) presents the inquiry CommandQ which has MOOD as its parameter and thus depends on the prior identification of MOOD.

These interdependencies constitute some kind of organization among choosers.

(1) Hub-flow organized by system network

Typically, however, no special measures are needed to reflect the interdependencies. They are captured in the system network organization of the grammar. That is, the flow from identification of a hub to the use of it follows the

move from left to right in the system network, from less delicate to more delicate systems. At the beginning of the generation of a grammatical unit, the variable Onus receives an identity. Other hubs are then derived step by step by means of identifying inquiries:

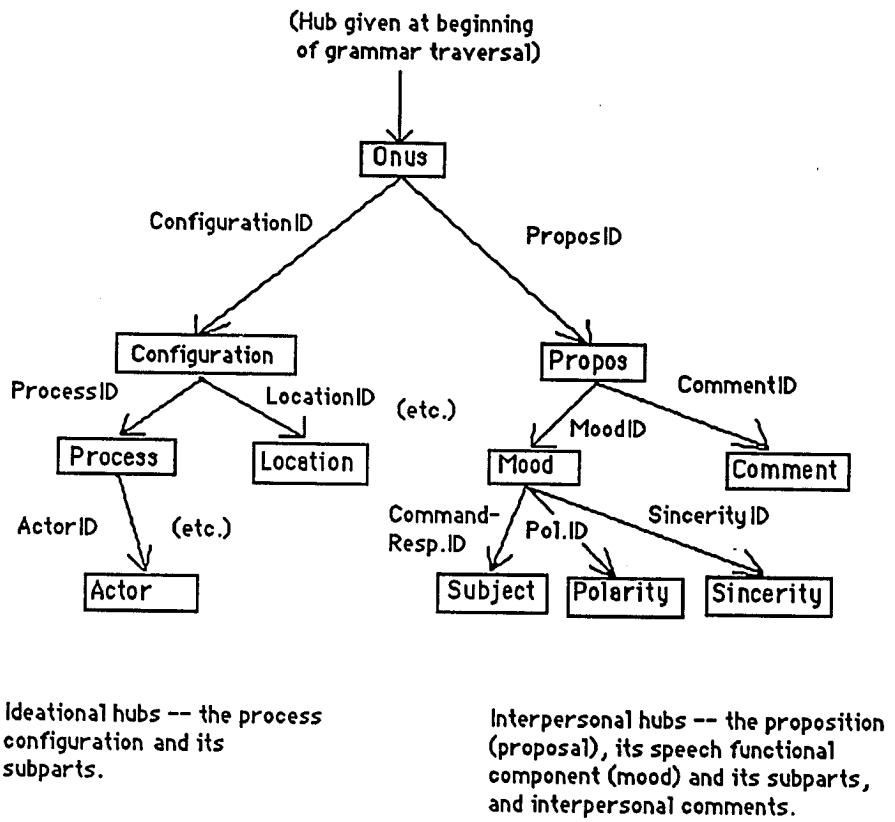


Fig. III:3-1: Stepwise hub-identification

For example, once it has been determined that the grammatical unit being generated is an independent clause, the speechfunctional value of Mood can be identified and the parameter can be used in subsequent choosers in the MOOD area of the grammar.

The hub associated with the function Process is another good example. It can be identified very early in the system network, as soon as the relevant chooser has established that a clause is going to be generated. Then follow in parallel (among others) the systems AGENCY and PROCESS TYPE. The choosers of both systems present inquiries that have Process as a parameter and thus make use of its hub association. Similarly, systems further to the right in the network have choosers whose inquiries mention Process. Since its hub has been identified in a chooser whose system was entered before these later systems become enterable, there is no problem.

(2) Problem: unordered, simultaneous systems

However, there are cases where systems with the same entry conditions have choosers whose inquiries presuppose one another. I will return to the area of tense for an illustration. SECONDARY TENSE relates a reference time t_1 to another time t_2. The identity of the reference time is established in the chooser of the parallel system DEICTICITY. The relevant part of the system network is diagrammed below.

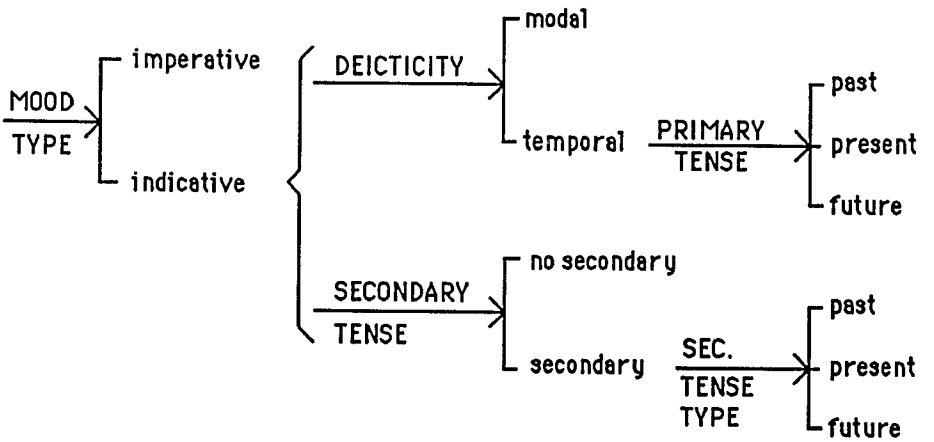


Fig. III:3-2: Tense in the system network

The chooser of DEICTICITY is diagrammed below in Figure III:3-3. If the feature temporal is chosen in DEICTICITY, the initial reference time, t0, which is the time of speaking, will be related to t1 by the PRIMARY TENSE selection; the value of t1 is established as the time to be related to t0. The task of the next tense selection is to relate t1 to the next time in the temporal chain to be expressed, viz. t2. However, if the clause is modalized, PRIMARY TENSE is 'displaced' by the expression of modality and the task of expressing the relation between t0 and t1 has to be taken over by SECONDARY TENSE. This is handled in the chooser by simply copying the value of t0 to t1 (t0 -> t1).

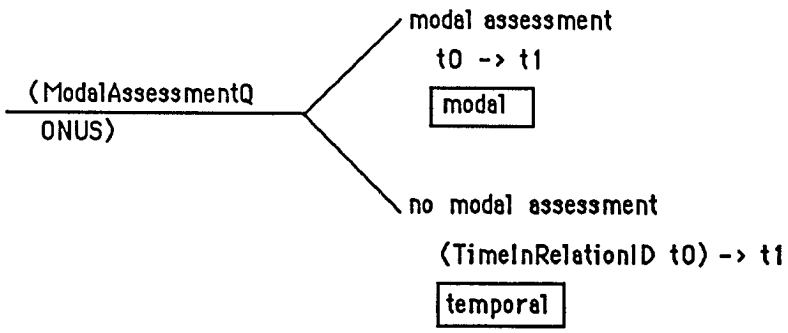


Fig. III:3-3: The DEICTICITY chooser

When there is a secondary tense, it relates t1 to t2. Now, if SECONDARY TENSE is entered after DEICTICITY, there is no problem. It is possible to determine whether a secondary tense is needed or not. However, since the two systems are simultaneous in the system network, there is no guarantee that DEICTICITY will be entered first. The first system to be entered might equally well be SECONDARY TENSE and in that case there is no association for t1 and thus no basis for deciding whether a secondary tense is needed or not.

(3) Classes of solutions

How is the situation to be avoided where a chooser is entered before all the hub associations needed are in place? There are at least three classes of solutions.

(i) Grammatical solution: extrinsic statements are added to control the order of entry of simultaneous systems.

(ii) Semantic solution - 'precomputed' as a network: inter-chooser organization is added to the semantic interface. -- The interdependency statements might thus be taken to be a fragment of an inquiry network.

(iii) Semantic solution - dynamic, built into the traversal algorithm: we can see the interdependencies as relating to the availability of information in the Function Association Table (cf. Section III:1.3); a missing association just leads to a postponement of the particular choosing process where the inquiry occurs.

I will start with the first strategy, which is the one used in current Nigel and is unsatisfactory.

(i) Extrinsic ordering of system entry. Simultaneous systems in the system network are unordered, so in situations such as the one involving the simultaneous systems DEICTICITY and SECONDARY TENSE, the current strategy is a statement specifying the order of system entry to ensure that hub associations are created before they have to be used. For example, we state that DEICTICITY is to be entered before SECONDARY TENSE. The form of the statement is simply a list of lists:

((DEICTICITY) (SECONDARY TENSE))

which means that the systems on the first list are to be entered before the systems on the second list as long as they are unordered in the network.

These statements represent chooser interdependencies that exist over and above the system dependencies in the system network. The practical problem with this strategy is that these statements are hard to keep track of in cases that are more complicated than the illustration in the area of TENSE. In particular, if two systems that are unordered with respect to one another are not immediate sisters but are descendants of simultaneous sister systems, it is not sufficient to order those two systems but their ancestors have to be ordered as well. This practical problem reflects a theoretical one. The hub-flow type of interdependency is an inquiry-semantic issue, not a grammatical one: it does not have anything to do with the logic of system entry; controlling system entry has just been an easy temporary solution.

If we see hub-flow as an inquiry-semantic issue rather than as a matter of system entry, there are at least two additional ways of dealing with it -- (ii) and (iii) in the list above.

Before I discuss these approaches, I will characterize the existing system dependencies. There are three categories of extrinsic system-entry orderings created to deal with hub-flow in the current grammar:[13]

(a) experiential: Agent is used in inquiries, but does not receive an independent hub identification. The systems whose choosers use Agent have to wait until after Agent has received a hub through CopyHub.

(b) interpersonal: Subject is used in inquiries, but does not receive an independent identification. The systems whose choosers use Subject have

[13] The order of system-entry is also controlled for other purposes: cf. Section III:4.2.

to wait until after Subject has received a hub through CopyHub.

(c) logical: choosers that identify the times in the time series to be expressed by TENSE have to be activated before the choosers that use these time hubs.

The cases of Agent and Subject are quite similar and I will focus on these, setting aside the problem with the logical metafunction.

(a) Experiential: Agent. In the experiential area of the grammar, there are two perspectives on the transitivity organization of the clause. There are two sets of transitivity functions, the process-type specific transitivity ones such as Actor, Phenomenon, and Token, and the generalized ergative ones such as Agent and Medium (cf. Halliday, 1985: Section 5.8). Only the former have independent identifying inquiries in the current version of Nigel. The hubs that are identified for them are copied onto the ergative transitivity functions Agent and Medium. In the case of Agent, the identification and the CopyHub occur in different systems:

identification	copy hub
PROCESS TYPE chooser (ActorID Process) -> Actor	**EFFECTIVE MATERIAL chooser** Actor -> Agent
(PhenomenonID Process) -> Phenomenon	**PHENOMENAL AGENT chooser** Phenomenon -> Agent

Fig. III:3-4: CopyHub to Agent

Consequently, no inquiries can be asked about Agent until these CopyHub statements have been performed. The process-type specific transitivity functions are identified in the chooser of PROCESS TYPE and the function Agent is applicable to effective clauses as opposed to middle ones (the AGENCY system: effective / middle). If the systems PROCESS TYPE and AGENCY are simultaneous, we have to ensure that none of the choosers whose systems have 'effective' as their entry condition and rely on a hub-association for Agent are entered until Agent has received its hub in the choosers of EFFECTIVE MATERIAL, PHENOMENAL AGENT, etc..

The situation with Subject is comparable. Unless the clause is an imperative one, Subject receives its hub through CopyHub rather than through an independent identifying inquiry.

Clearly, these two situations can be addressed by specifying independent identifying inquiries for Agent and Subject. In the case of Agent, there is no problem in identifying a semantic / conceptual correlate to this grammatical function by means of an AgentID. My reason for not doing this has been to avoid the possibility that ActorID and AgentID would identify different hubs for the same constituent Actor/Agent. However, this reason does not seem to be a very strong one: if they received different hubs, there would be something incongruous about the demands placed on the grammar in the first place and we are not developing the grammar and its semantics to filter out incongruous interpretations of reality.

(b) Interpersonal: Subject. The Subject case is more interesting, since it violates a generalization which says that hubs are not copied across

metafunctional boundaries: its hubs come from transitivity functions. If Subject had its own identifying inquiry, we could dispense with all the control of system-entry presently needed to assure the presence of a hub for Subject. It only has its own identifying inquiry in one case. If the response to CommandQ in the chooser of the MOOD TYPE system is COMMAND, Subject gets a hub-association by means of an independent inquiry, CommandResponsibleID: (CommandResponsibleID Mood) -> Subject (see Figure III:2-1). However, in all other cases, Subject gets a 'second hand' from a transitivity function (Agent, Medium, Beneficiary, or Range) in a VOICE system by means of CopyHub: Agent -> Subject, Medium -> Subject, etc..

Why not give Subject an independent identifying inquiry in these other cases as well? The reason is that I do not know yet how to characterize the function Subject in terms that can be interpreted in the Environment. The problem here is an instance of the general problem of restating the meaning of grammatical categories, in the first instance in English and in the second instance by means of some implementation. It's the problem of *ineffability,* discussed in Halliday (198). Halliday (1985: 76) characterizes Subject in terms of ***modal responsibility.*** It is the participant "responsible for the functioning of the clause as an interactive event". He suggests that it may be easier to see the principle of modal responsibility in a proposal (offer or command) than in a proposition (statement or question):

> the Subject specifies the one that is actually responsible for realizing (i.e., in this case, for carrying out) the offer or command. For example, in *I'll open the door, shall I* (offer) the opening depends on me; in *Stop shouting, you over there!* (command) it is for you to desist or otherwise.

It is this specialized type of modal responsibility that is reflected in CommandResponsibleID -- responsibility for realizing the action commanded, which, as mentioned above, is used to identify Subject in imperative clauses:

> Who is the participant identified as responsible for realizing the process whose realization is commanded in MOOD [the current speech function]?

Similarly, the notion of modal responsibility is clear in the case of modulated clauses (clauses with a modality of permission, volition, and ability): the modally responsible participant is the one on whose ability, will, or permission the validity of the proposition depends, as in

```
Henry won't be persuaded
Henry can't be persuaded
You must deliver the parcel by five
May I leave now?
```

However, it is harder to make the notion of modal responsibility operational for the Environment in the case of non-modulated indicative clauses. Halliday (op cit.) writes the Subject is "the one on which the validity of the information is made to rest" and if this characterization can be made operational, the hub-flow problems Subject is currently involved in will have been addressed. The task is partly one of developing a stronger interpersonal world view in the environment to complement the ideational one; i.e. to develop the interaction base alongside the ideation base so that it can support notions such as validity, responsibility, and argument.

I won't pursue the question further here, except to note that there are clear indications that the selection of Subject is indeed interpersonally meaningful. Halliday points to its function in the specification of MOOD and in tag questions. We can also see the control of modal responsibility in examples such as *Britain ruled India and India was ruled by Britain* (from the New Republic) where the voice reversal is used to suggest that both Agent and Medium are modally responsible and in the use of interpersonal comments focussing on Subject (GCE 8.41 ff, Subject adjuncts, e.g.: *reluctantly he was in London, bitterly he buried his children*).

I have characterized the existing system dependencies used to control hub-flow. Although they may all eventually go away if functions such as Subject and Agent are given independent identifying inquiries, we still need to be prepared for the need to control hub-flow and consider the two 'semantic' solutions.

(ii) As part of an inquiry network. While the hub-flow problem points to a kind of semantic organization beyond the isolated chooser, it seems better not to record this organization synoptically in a network of inquiries.

(a) One reason is that the organization is predictable from a produced - consumer perspective on inquiries. That is, the simple principle is that choosers that rely on the existence of particular hub associations have to follow choosers that produce these hub associations and add them to the Function Association Table.

(b) Another reason is that such a network would get needlessly complex at times: when a particular variable can receive its hub in a variety of different contexts, all of these would have to be collected in a disjunctive type of inquiry presentation condition for the inquiry using the hub association. For instance, both of the branches of the DEICTICITY chooser of Figure III:3-3 above would have to appear in a disjunctive presentation condition of the first inquiry with t_1 as a parameter to ensure that the t_1 variable has received a hub association.

(iii) As part of generation algorithm. Instead of 'pre-computing' hub-flow dependencies, we can build it into the the generation algorithm. There are at least two ways of doing this.

(a) The dependency is a matter of not using information until it has been produced: an inquiry parameter cannot be queried until it has a hub associated with it. Consequently, we can specify that the generation algorithm should simply postpone the presentation of a particular inquiry and continue with the system traversal if the parameter of the inquiry lacks its hub association.

(b) Alternatively, we can simply remove identifying inquiries from specific choosers and let them be presented daemonically: whenever an inquiry parameter without a hub association is encountered, the corresponding identifying inquiry is presented. This presupposes that there is a table of parameters and their identifying inquiries. This method would work, in principle, as long as the identifying inquiry used is not dependent on the context of presentation. As the DEICTICITY chooser illustrates, there are cases where a parameter receives an association in different ways depending on the context.

3.1.2 Obtaining and loosing information: simultaneous systems

We've seen how information from the Environment is embodied in a chooser tree in the responses under which further inquiries can be embedded. The response to a branching inquiry is part of the structure of the chooser that presents it and can thus be used within that chooser.

3.1.2.1 Transmitting information outside a chooser

However, it cannot be used directly outside the chooser that presents it. It can be used indirectly. If the response leads to the choice of a grammatical feature and another chooser whose system presupposed the selection of that feature is reached, the response that led to the selection of the feature can, in principle, also be presupposed and does not have to be obtained again.

For example, the chooser of INDICATIVE TYPE determines whether the speech functional value of MOOD is that of a question or not by asking QuestionQ. If the response is 'question', the feature interrogative is chosen and this is the only response that leads to the choice of interrogative. Consequently, the choosers of systems that have interrogative as an entry condition can present inquiries that presuppose the response 'question', as in the chooser of INTERROGATIVE TYPE, which presents the inquiry PolarityVariableQ:

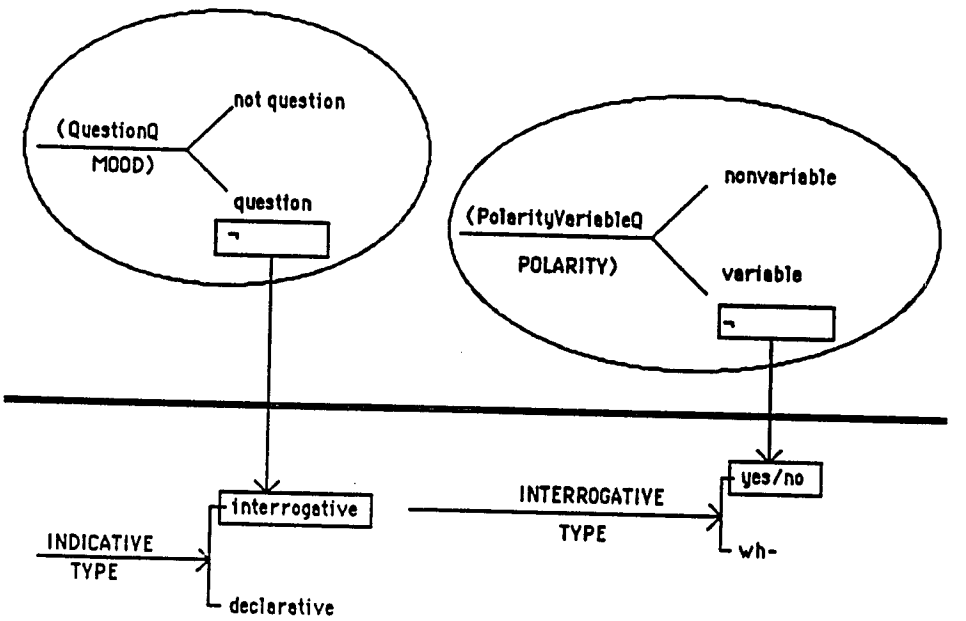


Fig. III:3-5: Inquiry responses encoded in grammatical features

However, when a chooser inquiry of one chooser obtains information needed by the inquiry that is part of another chooser and their respective systems are independent of one another both choosers have to present the same inquiry.

3.1.2.2 Information transfer among choosers of simultaneous systems

We can think of this situation as follows. Two systems are grammatically independent -- 'compositional' in terms of the system network -- but they are not semantically independent or compositional to the same extent. The situation can be illustrated with two systems from the interpersonal part of the clause network, POLARITY and COMMENT; their choosers both use inquiries that are also used in the MOOD systems that are simultaneous with POLARITY and COMMENT:

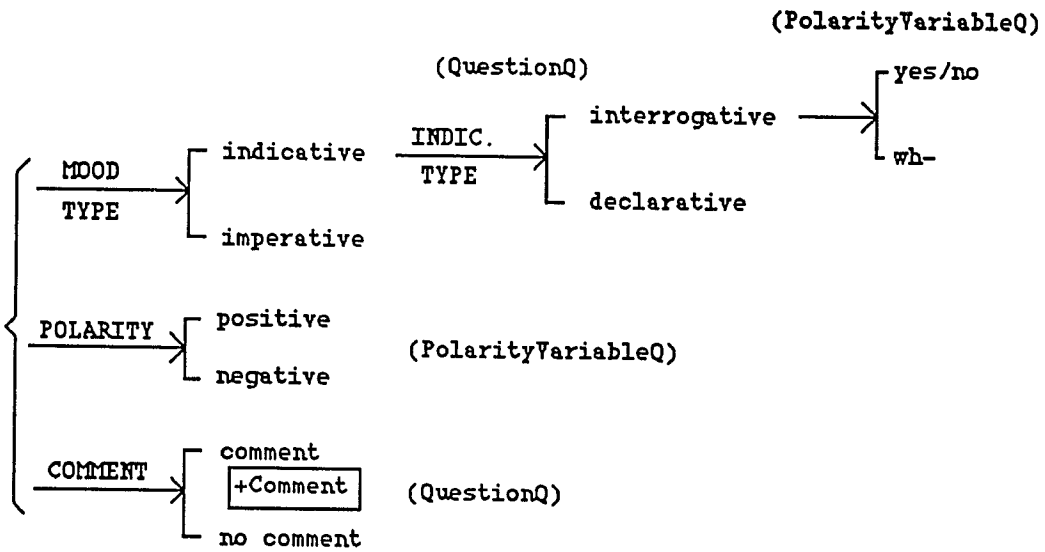


Fig. III:3-6: Re-use of inquiries (QuestionQ etc.) in interpersonal component

(i) The POLARITY chooser. We have already seen the chooser of the POLARITY system (Section 2.4, Figure III:2-13). Its first inquiry is PolarityVariableQ, which is used to establish the context for the subsequent

inquiries concerning the polarity value. As we have seen (Figure III:3-5), PolarityVariableQ is also used in the chooser of INTERROGATIVE TYPE to distinguish between yes/no interrogatives and wh- ones.

(ii) The COMMENT chooser. The grammar has a system that allows the generator to introduce a comment on the sincerity of the communicative exchange, e.g. *frankly, honestly,* or *sincerely.* Grammatically, this COMMENT system is independent of the MOOD TYPE system; see the system network above. A Comment can occur in all the major MOOD types:

`Frankly, I don't know what you mean by that` (declarative)
`Frankly, what do you mean by that` (interrogative)
`Frankly, never try to please Henry` (imperative)

In all three examples, *frankly* is a comment on the communicative exchange, but, typically, its orientation varies according to the MOOD type (cf. GCE Section 8.80). In declarative and imperative clauses, it is speaker-oriented -- 'I'm telling you frankly'; but in interrogative clauses it is addressee-oriented -- 'you tell me frankly'.

Now, if we want to reflect these two different orientations in the inquiries used to determine whether to comment or not, the chooser of the COMMENT system cannot rely on the information obtained by the MOOD choosers, since the COMMENT system and the MOOD TYPE systems are independent of one another. That is, the chooser of COMMENT is one 'parcel', separated from the choosers of MOOD TYPE and INDICATIVE TYPE:

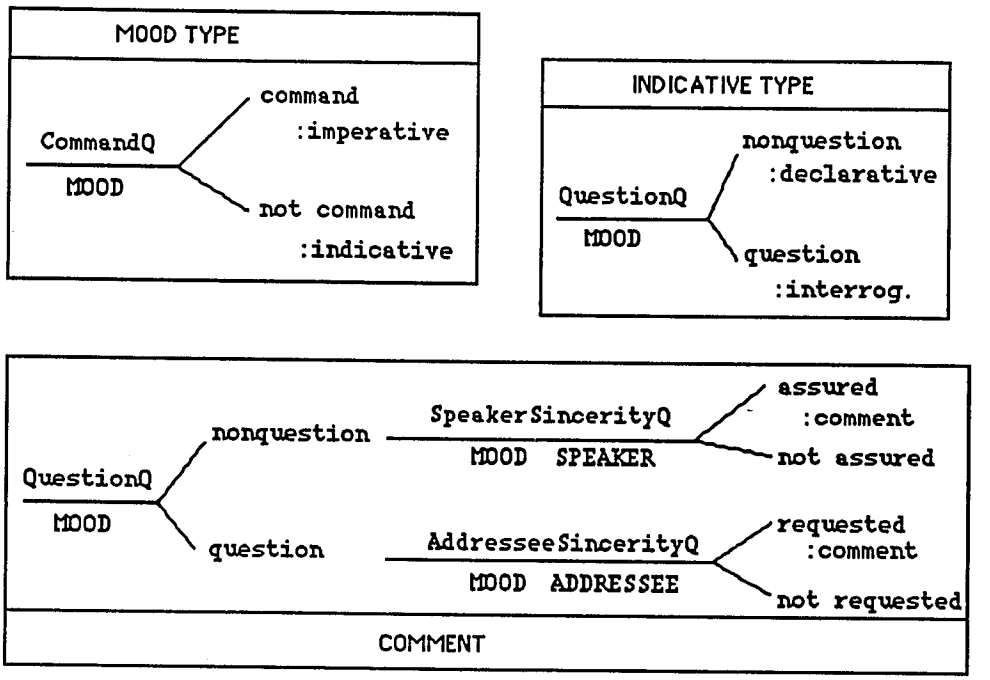


Fig. III:3-7: Repetition of inquiries due to chooser tree parcels

We find similar problems with various interpersonal evaluations (e.g. modal *perhaps, probably,* and so on) and, as we have seen, with POLARITY. MOOD TAG also provides an example from the interpersonal part of the clause grammar. While it is possible to set up one general grammatical MOOD TAG system whose entry condition is a disjunction of 'declarative' and 'imperative', the chooser of such a system has to distinguish between the two entry contexts as statements and commands. In the case of a statement, tagging is used to request an indication of agreement -- the response that doesn't automatically follow a statement. In the case of a command, tagging is used to request an indication of willingness to comply with the command.

To sum up, the general problem investigated here is that simultaneous systems in the grammatical system network are grammatically independent but they may interact semantically. The symptom of this semantic interaction in the chooser and inquiry framework is that the choosers of simultaneous systems may need re-use the same inquiries. For instance, as we have seen, the choosers of both the COMMENT system and the INDICATIVE TYPE system use the inquiry QuestionQ.

3.1.2.3 Classes of solutions

There are at least two classes of solutions, grammatical and semantic ones:

(i) Grammatical solutions, description: Revise the grammar by splitting a single system into two for semantic reasons.

(ii) Semantic solutions, framework: Change the chooser and inquiry framework in such a way that inquiries may be conditional not only on responses to other inquiries within the same chooser but also on inquiries from other choosers.

(i) Grammatical solutions

When a single system is split into two, the two systems are given more specific entry conditions than the single system had, so that their choosers can rely on previously acquired information and present their inquiries in appropriately

constrained contexts. The revision is grammatically unmotivated unless the semantic distinctions are found to have previously unnoticed consequences within the grammar. This grammatical type of solution would lead to two COMMENT systems. One would have 'interrogative' as its entry condition and the other a disjunction of 'declarative' and 'imperative'; see the figure below.

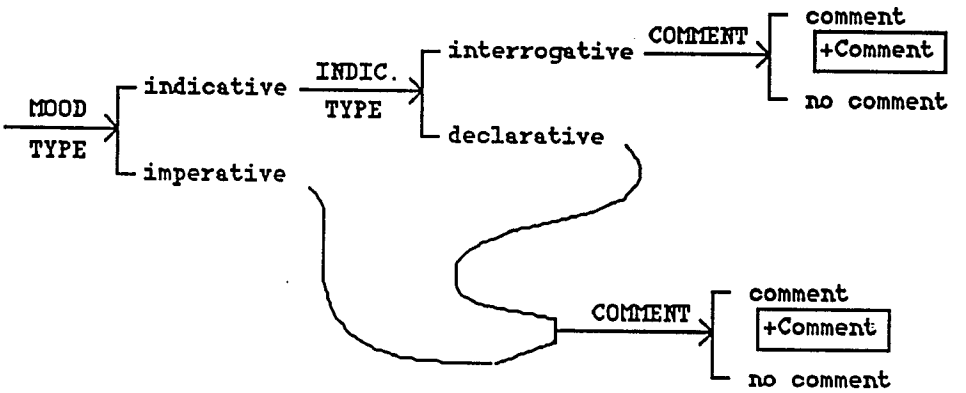


Fig. III:3-8: Grammatical solution

With this grammar, the same kind of realizations, +Comment etc., will either have to be stated twice, or we have to write an additional gate with a disjunctive entry condition where the realizations can be stated once. In either case, there is a loss of a generalization in the grammar as a result of our attempt to avoid a repetition of the same inquiry in different choosers. Obviously, an isolated case is no cause for worry, but there would be a number of such changes to the grammar.

(ii) Semantic solution

The second semantic approach avoids this problem. It leads towards an organization of inquiries into a network rather than an organization into decision trees parcelled into choosers: see Section III:4.

3.2 Considerations from below: non-adjacent realizations

Up to now I have considered problems for the chooser organization that have to do with the organization of inquiries within the semantic interface itself. I will now turn to considerations from below, from the grammar, that suggest that we need to go beyond system-based choosers in the organization of inquiries.

If we consider the realization of an inquiry response or set of inquiry responses, it is clear that the local association of a chooser with its system will work as long as the domain of realization is that system alone. However, if the domain extends beyond that single system, there is a problem. This extension can happen in either of two ways.

(i) There are alternative realizations that belong to different systems rather than a single system.

(ii) There is a conjunction of realizations affecting more than a single system.

Let's look at these one by one.

(i) Alternative realizations in different systems

In Chapter II (Sections 2 and 3.2), I discussed agnations that are not systemicized within the grammar: expressive alternative strategies occur in the grammar in different grammatical context such as the clause complex and the clause or the clause complex and the nominal group complex; grammatical metaphor is a major source of this phenomenon. One way of dealing with that problem is to say that the systemic alternation itself lies outside the grammar at the semantic level. However, this requires of the semantic framework that it should be able to refer to different parts of the grammar at the same time. We can turn to MODALITY for an illustration of the problem. The expression of MODALITY can be achieved in a number of different ways, (i) congruently within one clause or (ii) metaphorically by means of a projecting clause complex, where the modality is expressed as a projecting clause (cf. Halliday, 1985: Section 10.4.1):

MODALITY	(1) modal ¬ Finite: modal aux. *can & c.* (2) modal adjunct (& temporal / modal) ¬ + Modal *perhaps & c.*	(i) one clause Congruent: modality as constituent.
	(1) personal *I think & c.* (2) impersonal *it is possible & c.*	(ii) two clauses Metaphorical: modality in projecting clause -- $\alpha \longrightarrow \beta$ mod.

Fig. III:3-9: Alternative strategies for expressing modality

Two of these strategies lie outside the single clause -- e.g., *I think he has left* and *it's likely that he has left* -- and were discussed in Section II:3.3 (they belong to the third stage of a possible revision of the inquiry interface mentioned at the beginning of Section III:3: I will return to them below); but two are alternative strategies within the single clause:

(1) Modal auxiliary: `he will have left`

(2) Modal adjunct: `he has probably left`

The two resources are not represented as systemic alternatives within the current clause network, since they are independently variable and have different realizations. Instead, there are two simultaneous systems within indicative clauses, one temporal / modal and one modal adjunct / no modal adjunct:

	temporal	modal
no modal adjunct	*he has left*	*he has <u>certainly</u> left*
modal adjunct	*he <u>must</u> have left*	*he <u>must</u> <u>certainly</u> have left*

Fig. III:3-10 : Modality as Adjunct and Finite

Since the systems are independent, there is no way of setting up a chooser to choose between the two strategies or to control the use of the two simultaneously. However, if the semantic interface could range over more than one system in reacting to the different responses to the same inquiry, different

grammatical strategies of the type just illustrated could be coordinated. For instance, following Halliday (1985: Section 10.4), we could define an inquiry concerned with the orientation of the specification of the modality: is it subjective ('I'm sure'), objective ('it is certain'), or both (cf. also Lyons' (1977) distinction between 'I say so' and 'it is so'):

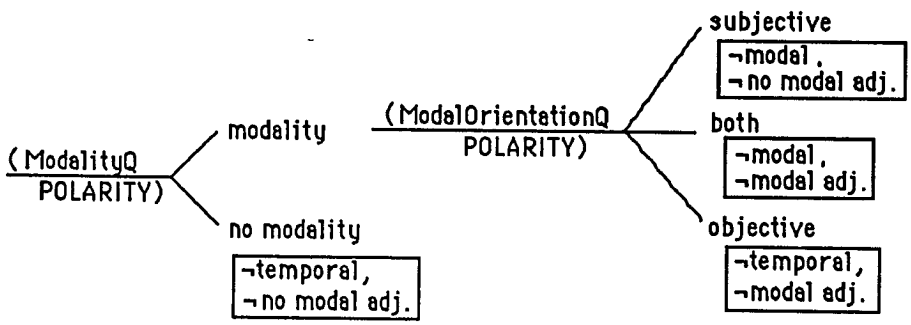


Fig. III:3-11: Choosing in more than one system

Examples similar to MODALITY in offering expressive resources that are 'distributed' in the grammar include

CONJUNCTION: structural conjunction (*and, but, or* etc.) and non-structural conjunction (*also, however, nevertheless, alternatively*, etc.).

REALITY, in intensive & ascriptive relational clauses: incorporated in ascription (*seem, appear; prove*) or as part of expanded verbal group (*seem to be, appear to be; prove to be*).

CIRCUMSTANTIAL MODULATION: as circumstance (*do quickly, do tentatively, do by chance, do first* or as part of expanded verbal group (*hasten to do, venture to do, happen to do, begin by doing* etc.).

MODIFICATION, in the nominal group: premodification as word (*wooden chair,* etc.) or postmodification as rankshifted phrase (*chair of wood,* etc.).

At present, the only means for coordinating distributed expressive resources such as these is the extrinsic specification of system-entry order. It is clearly not sufficient, since it does not allow the semantic interface to exercise a principled choice. All it does is control the order in which the grammatical resources are explored.

(ii) Simultaneous: marking conventions revisited

Conditional marking conventions were identified in Chapter II as a systemic device not used in Nigel. Consider again the example from TRANSITIVITY. The systems AGENCY and PROCESS TYPE are simultaneous, but there is a gap in the paradigm, since verbal clauses are middle but not effective.[14] Systemic linguists have represented gaps of this kind by specifying conditional marking convention: if verbal (†), then also middle (*):

[14] As was mentioned in the discussion of marking conventions in Chapter II, the existence of the gap depends on the analysis. If we follow Martin in treating clauses with *tell, notify,* etc. as effective, the gap disappears. However, this does not affect the general need to deal with paradigmatic gaps of this kind.

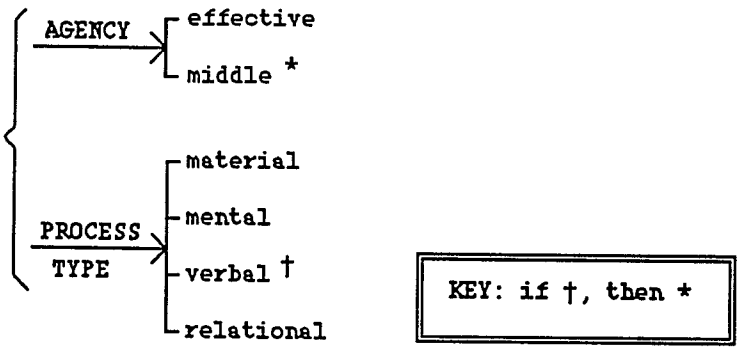


Fig. III:3-12: Grammatical conditional marking convention

As we saw in Section III:1.2 the marking convention of 'unmarked' choice can be represented at the chooser and inquiry stratum as a default choice and the chooser and inquiry level would also seem to be the obvious place to deal with the conditional marking convention. That is, we can imagine a chooser that elicits the information needed to select the grammatical feature verbal in the system PROCESS TYPE and then also chooses middle in the AGENCY system:

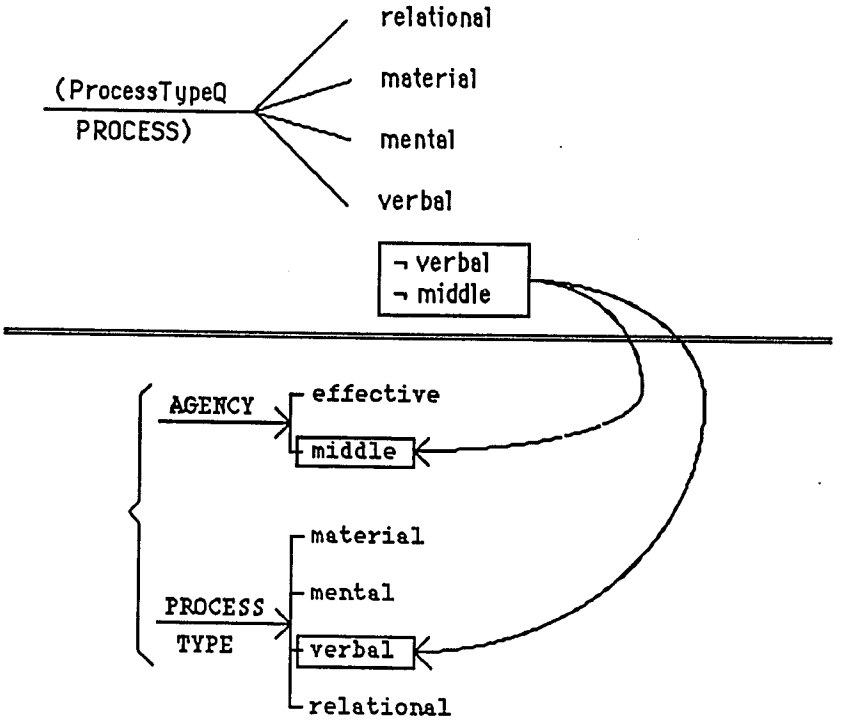


Fig. III:3-13: Choice of features from more than one system

This method would work except that a chooser is restricted to choosing among the features of the system it is associated with.

3.3 Considerations from above

It was pointed out in Section III:1.1 that the semantic inter-level can be approached from below, from lexicogrammar, or from above, from context. The notion of the chooser reflects the grammar-based approach; it relies on the local organization of the grammatical system network. If we want the organization of

inquiries to reflect the organization of context as well, it may be necessary to allow for more flexibility than the chooser-packaging does. I will take up this concern in Section III:6 below.

4. Towards a network of inquiries (1)

We have seen that the chooser tree organization of inquiries runs up against problems. As long as these problems are confined to single choosers, we can address them by means of the tree organization, for instance, disjunction can be simulated (Section III:2.3); but we also find many examples of a need to relate inquiries beyond single choosers (Section III:3). There are at least two possible approaches here:

(i) We can add to the set of possible chooser actions so as to allow choosers to exhange information not only with the environment but also with one another.

(ii) We can abandon the chooser packaging and create a more global inquiry organization.

I will explore the second alternative here, replacing the assumption that inquiries are organized into decision trees that come in chooser parcels local to each system with the assumption that they are organized globally into an inquiry network. I will explore this possibility in a number of steps (Sections 4, 5, and 6).

4.1 Complex presentation conditions

The first step in the direction of a network of inquiries, the step discussed in this section, can be stated as follows.

Inquiries are organized in the same way as systems. That is they have presentation conditions that can be either simple or complex and form a network (directed acyclic graph).

This assumption about the organization of inquiries differs from the chooser organization both with respect to the type of organization (tree vs. network) and the globality of the organization (local chooser packages vs. global network):

chooser framework	inquiry network
inquiries are organized into decision trees	inquiries are organized into networks
decision trees form choosers, local to systems	inquiry networks are not local to particular systems

Fig. III:4-1: Chooser framework vs. network framework

There are at least two alternative ways of introducing the complex inquiry presentation conditions.

(i) We can define an *inquiry presenter* that consists minimally of (a) an inquiry presentation condition and (b) a branching inquiry.

(ii) Alternatively, we can think of the inquiry itself as being enhanced with an inquiry presentation condition.

Here, I will follow the second alternative, although there are certain reasons to prefer the first.[1] Inquiries enhanced with presentation conditions according to the assumption are diagrammed schematically below; a, x, y, etc. are responses.

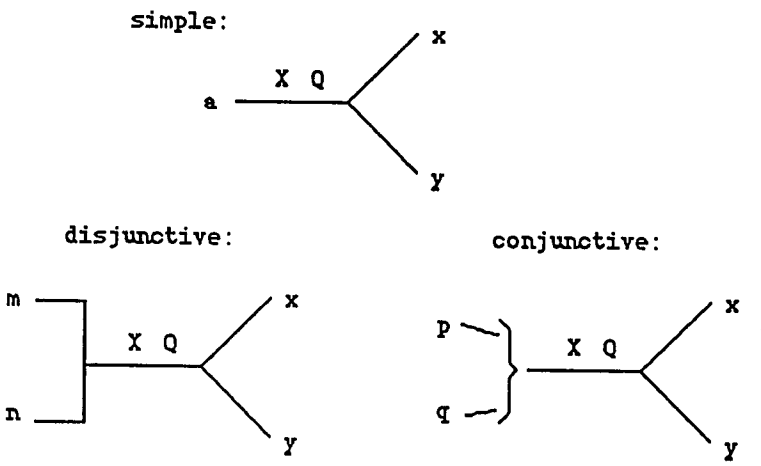


Fig. III:4-2: Inquiries with presentation conditions

We can return to the example with MOOD and COMMENT for an illustration of the use of a disjunctive presentation condition. A fragment of an inquiry network is given below.

[1] In particular, the same inquiry may be used in different contexts, calling for different inquiry presentation conditions. This can be handled if different inquiry presenters use the same inquiry.

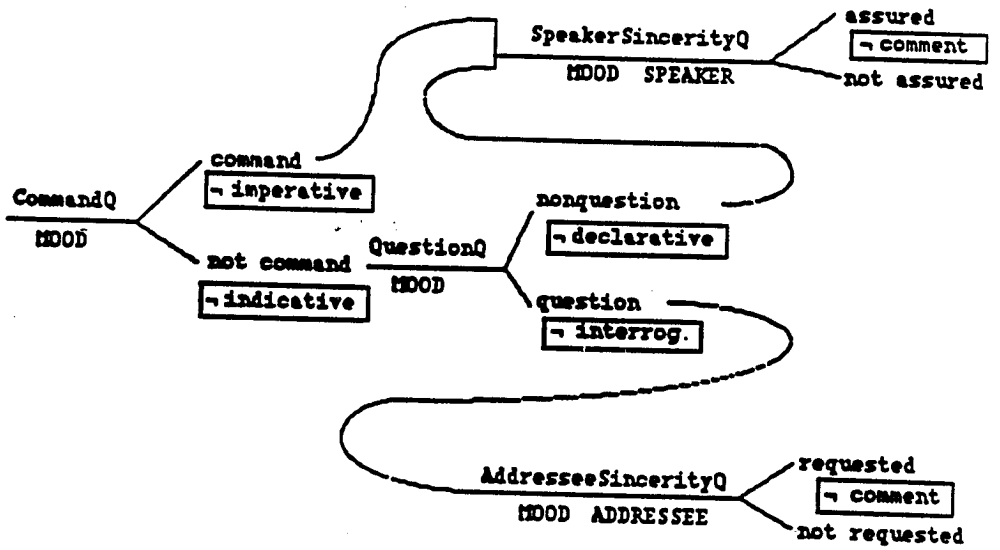


Fig. III:4-3: Inquiry with disjunctive presentation condition

If the response to the inquiry QuestionQ is 'question', the inquiry AddresseeSincerityQ can be presented. If the response is 'nonquestion' or 'command', the inquiry SpeakerSincerityQ can be presented.

Since the inquiry network is global rather than local to systems, preselections associated with the responses to an inquiry may refer to more than one system in the grammatical system network. Further, preselections of features from different systems may be associated with a single response. The inquiry network can thus handle non-adjacent realizations of the type discussed in Section III:3.2 above.

The global inquiry network presupposes a generation algorithm that differs from the one discussed in Section II:1.2.1.6, which is based on the grammatical system network. I will return to it at the end of this section. In the meantime, I will discuss the descriptive consequences of adopting the inquiry network framework for the organization of inquiries.

The framework changes just proposed are formally simple but they lead to fairly fundamental descriptive consequences. I will consider examples of inquiry networks set up to choose in the clause part of the grammatical system network. We find two major clusters (cf. Figure III:3-1):

(i) An ideational-experiential cluster: inquiries that depend on the identification on the Process hub.[2]

(ii) An interpersonal cluster: inquiries that depend on the identification of the Mood hub.

As we will see in the illustrations in the next two subsections, the inquiry network involves grammatical systems that are simultaneous within each metafunction as well as metaphorical alternations not represented systemically in the grammar:

[2] I have also called the variable the hub is associated with Configuration to emphasize the fact that it includes participants and circumstances as well as the nuclear process (cf. Section III:3.1.1).

	interpersonal	experiential
interaction between simultaneous systems	MOOD & POLARITY, TAGGING	PROCESS-TYPE & AGENCY
	MOOD & COMMENT	PROCESS-TYPE & CIRCUMSTANCE
grammatical metaphor	speech functional metaphors	transitivity metaphors

Fig. III:4-4: Grammatical areas related by inquiry network

4.2 The interpersonal cluster

There is an identification of a speech functional hub for Mood early in the network; cf. Figure III:3-1 above. Once Mood has received the hub association, inquiries requesting information about this hub can be presented. There are two simultaneous inquiries. One addresses the nature of the commodity in the exchange: is it information or is it goods & services? The other determines whether the current part of the exchange is acted out by the speaker (response: 'interacting') or is reported (response: 'reporting'), leading either to direct speech or indirect speech.

(1) Interacting

I will follow up the interacting alternative first. The next inquiry is OrientationQ. It determines whether the commodity exchanged is given or demanded. The

responses to OrientationQ intersect with the responses to CommodityQ to define the traditional speech functional categories of statement, question, command, and offer. The first three are realized congruently by the major mood categories (for metaphorical realizations, see (4) below):

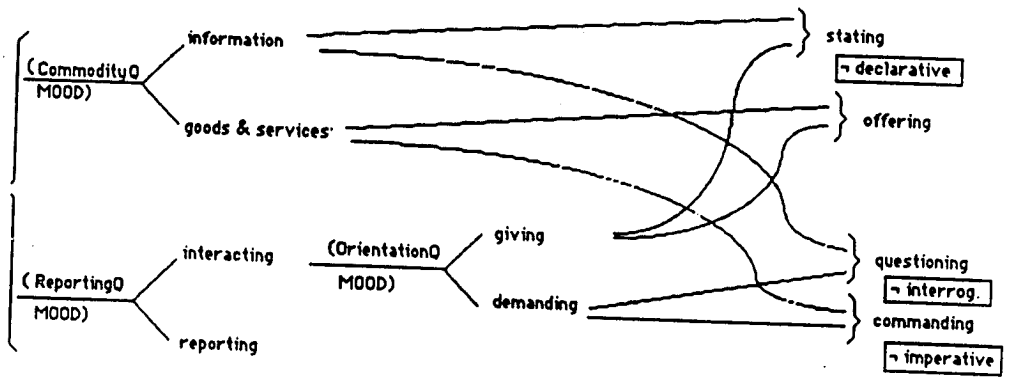


Fig. III:4-5: Interpersonal network of inquiries (1)

The disjunction of stating and commanding is the presentation condition of the inquiry concerning the speaker's **sincerity**, SpeakerSincerityQ; the question is whether the speaker's indication of sincerity should be specified. Questioning is the presentation condition of AddresseeSincerityQ; the question is whether the listener is to be encouraged to respond sincerely:

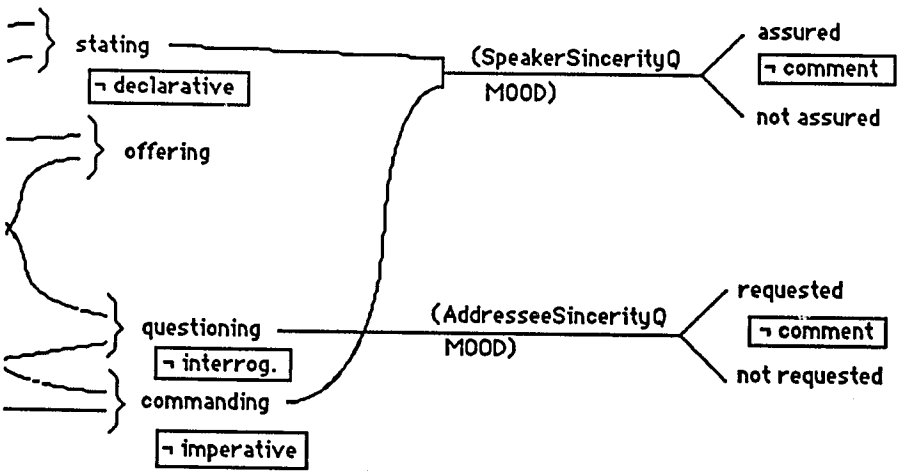


Fig. III:4-6: Interpersonal network of inquiries (2): sincerity

We can also fold **polarity** inquiries into the network. Questioning leads to PolarityVariableQ, which differentiates between polarity questions and other types by ascertaining whether the value of the polarity is variable rather than a fixed value. If it is variable, PolarityBiasQ is presented. In other cases, PolarityValueQ is used to determine the value of the polarity; the notion of 'other cases' is captured in a somewhat awkward disjunctions of three responses (giving, commanding, nonvariable):

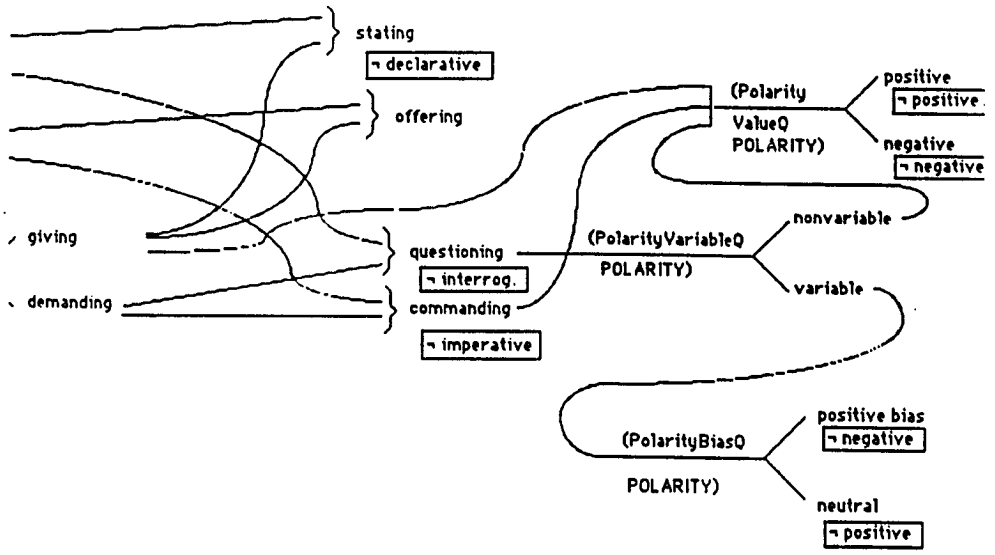


Fig. III:4-7: Interpersonal network of inquiries (3): polarity

(2) Reporting

When we turn to the reporting case, we see how the responses to CommodityQ are again relevant. Reporting and information define the category of proposition and reporting and goods & services define the category of proposal. There is thus no interactive distinction between giving and demanding in the reporting case. Instead, there is a distinction based on the nature of the proposition between open and closed information; if it is open, it includes a variable.

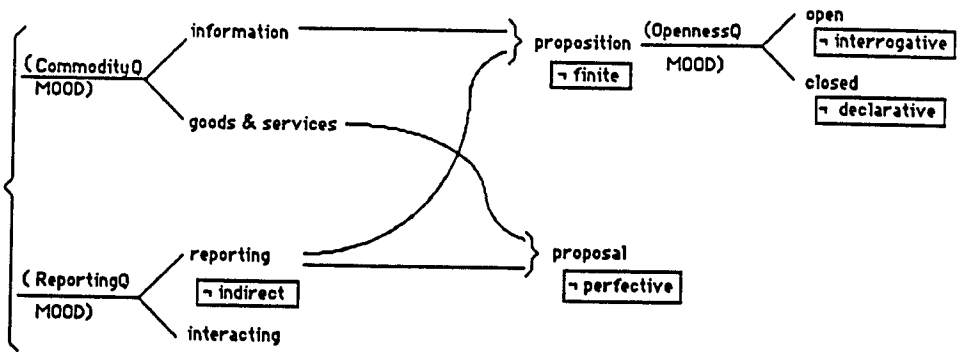


Fig III:4-8: Interpersonal network of inquiries (4): reporting

With the support of an interpersonal semantic network, I can now take the exploration two steps further. First I will consider the semantic integration of mood and key. Then I will suggest how we can deal with certain metaphors of mood.

(3) Mood and key

Together the mood selections of the clause and the tone selections of the tone group serve to realized a number of speech functional distinctions. If we define key as the part of speech functional distinctions expressed by means of tone rather than mood alone, we can characterize the possible approaches to a coordinated treatment of mood and key. I suggested above in Section 4.1.2 (2) that there are two classes of solutions to the problem of losing inquiry response information, one in terms of grammatical description and one in terms of a move towards a network of inquiries. Since both options are available here, it is useful

to be able to contrast them:

(i) mood and key can be integrated in the grammar, by positing key systems as dependent on the various mood systems;

(ii) mood and key can be represented as (largely) simultaneous regions of systems, leaving their coordination to the semantic stratum.

The first option is followed up in Halliday (1967). The second option presupposes a semantic network and we are now in a position to explore it briefly. At the grammatical level, MOOD and KEY are simultaneous and can be represented as follows.[3]

[3] The KEY network is based on Halliday (1985b), where the system of tones is explained (1 = falling, 2 = rising, 3 = level [/low rising], 4 = falling-rising, 5 = rising-falling, 13 = compound of 1 + 3, and 53 = compound of 5 + 3. Since the points of origins of KEY and MOOD are the information unit and the clause, respectively, they may not be in a one-to-one relation. I will only discuss the unmarked case when clause and information unit are co-extensive; cf. Section II:3.2.1.

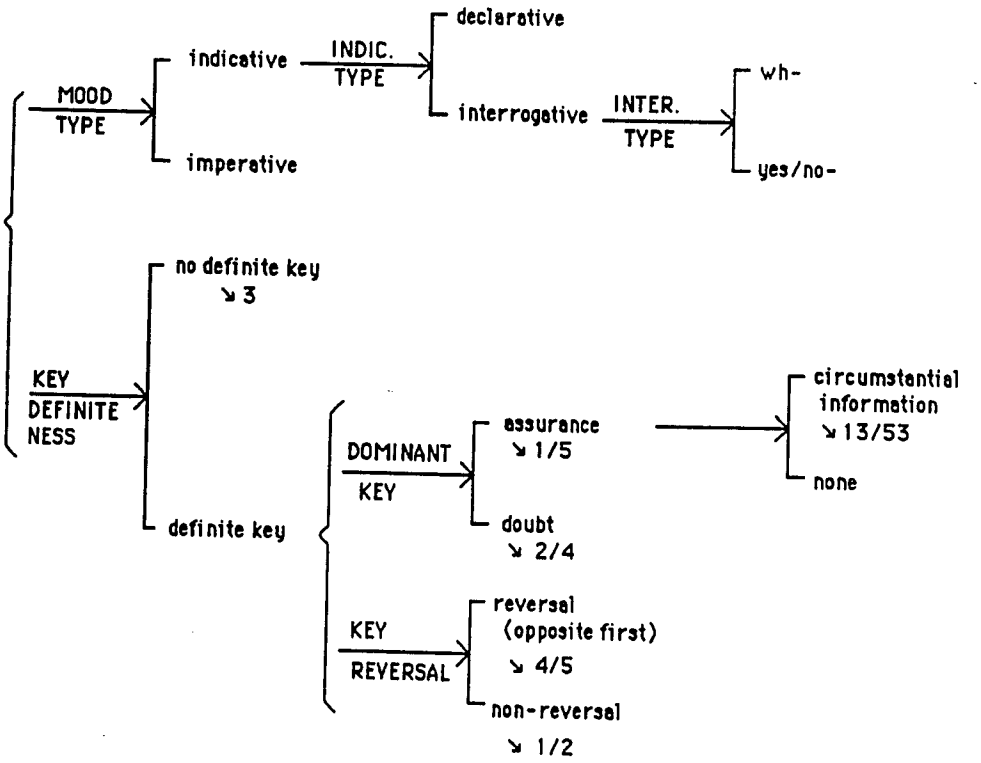


Fig. III:4-9: MOOD and KEY as simultaneous systems

While MOOD and KEY can be set up as simultaneous systems in the grammar and are realized independently of one another, they interact semantically to form speech functional categories that may not be predictable from the combinations of grammatical features. For example the precise meanings of the key features 'assurance' & 'reversal' depend on the context of the simultaneous mood selection. The typical speech functional categories are tabulated below (at the lowest degree of delicacy) as the (semantic) intersections of features

from the systems of MOOD (rows) and KEY (columns).

			no definite key	definite key			
				assurance		doubt	
			↘3 [–]	↘1 [\]	↘5 [^]	↘4 [v]	↘2 [/]
indic.	decl.		possibility statement	statement	assertion	reservation	contradiction, protest
	inter.	wh-		question			(i) tentative [wh not tonic] (ii) echo
		yes/no	uninvolved question	demand question	involved question	assertive question	(polarity) question
imperative		positive	invitation	command	insistent command	compromising command	question
		negative	prohibition	peremptory			
				non-	reversal (of key)		non-

Fig. III:4-10: Intersection of mood and key

Let's pursue the possibilities for statement and polarity question. For both of these, we can set up an inquiry concerned with the unmarked status of the speech function; but the subsequent inquiries dealing with the marked cases are different for statements and polarity questions. For instance, semantically, tone 4 realizes a reservation in the context of 'stating' but an assertive key in the context of 'polarity variable':

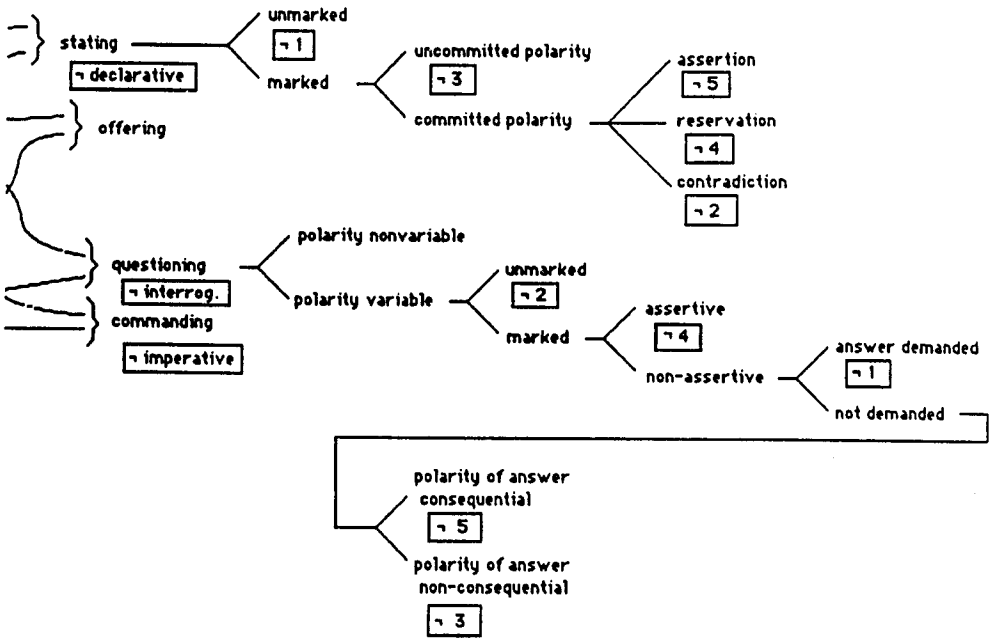


Fig. III:4-11: Speech function realized by mood and key

(Since all the inquiries have the same parameter -- MOOD -- I have left out the inquiry name and the parameter.) The inquiry network is set up to give priority to the choice of a mood category and to select the 'key' according to the subtype of the major speech functional categories 'statement' and 'question'.

(4) Metaphors of mood and modality

Certain interpersonal metaphors of mood involve alternatives to the congruent expression within the same clause. They can be handled by means of the inquiry network simply by *delaying in delicacy* the congruent coding as the realization of the primary speech functional categories such as commanding and questioning. For instance, a request (a polite command) may be oriented towards the addressee's ability or volition to carry out the service or provide the goods requested. This strategy is realized by a yes/no-interrogative clause, which is modulated and has an addressee subject:

```
Could you review this paper for me?
Would you give me the car keys?
```

This polite strategy is one of the many metaphorical alternatives to the congruent realization of an 'unadorned' command, the imperative clause. The two alternatives are set out in the following very simple fragment of the interpersonal inquiry network.

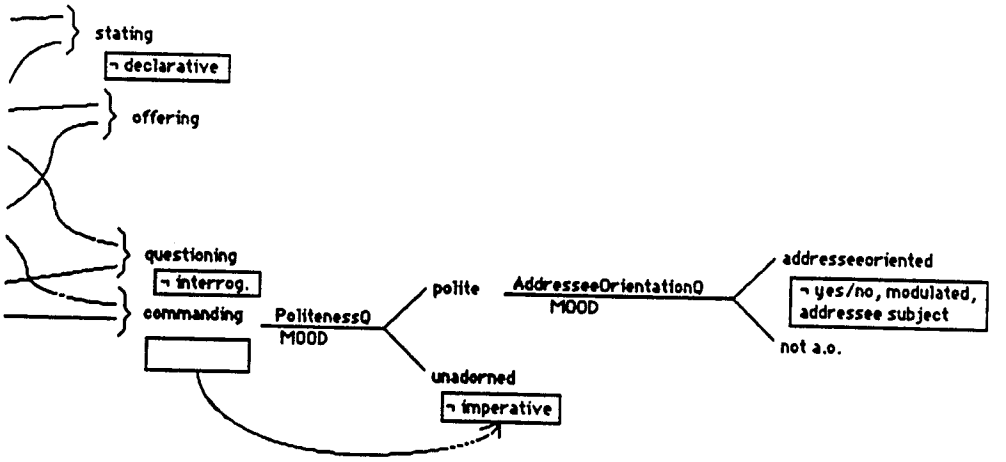


Fig. III:4-12: Interpersonal metaphor of mood in inquiry network

The selection of 'imperative' is pushed down in delicacy from 'commanding' to 'unadorned'. The example above illustrates how far metaphors of mood might be taken with the inquiry network discussed in this section. Certain other metaphors of mood such as *I wonder if you'd review this paper for me* require additional power from the inquiry network in its interaction with the grammar.[4] The same is true of metaphors of modality. Both will be taken up again in Section III:5.

[4] Another aspect not captured by the kind of inquiry network sketched above is the influence of the tenor of the relationship between speaker and listener on the choices of rhetorical strategies and the meaning of these strategies. I will touch on this kind of consideration in Section III:6.

4.3 The experiential cluster

There is an identification of a hub for Process early in the network. Once the association has been established, various inquiries that request characterizations of the hub can be presented. The purpose is to develop a lexicogrammatical representation of the process, its participants, and the attendant circumstances.

4.3.1 Semantic interdependencies and simultaneous systems

The network of inquiries enables us to handle semantic interdependencies between systems that are parallel in the grammar. In the experiential area, we find such interdependencies between PROCESS TYPE and AGENCY (cf. Sections III:3.2 (ii)) and between PROCESS TYPE and the various systems of circumstance.

One set of inquiries determines appropriate choices in the AGENCY system (effective/middle); another set determines appropriate choices in the PROCESS TYPE system (material / mental / verbal / relational). While they belong to the same metafunction, these two systems are simultaneous in the grammar, just as MOOD systems and the POLARITY system are in the interpersonal component. There is thus good reason to expect *semantic* interdependency 'cross-cutting' the *grammatical* simultaneity: on the inquiry-semantic stratum, there is interdependence between AGENCY and PROCESS TYPE (just as there is between MOOD and POLARITY), since agency seems to have specialized interpretations for relational processes and for mental and material processes.

That is, although there is a highly generalized agency distinction between middle and effective in the grammar, it is hard to define an inquiry or a set of inquiries that will distinguish between the two options regardless of process type.

In particular, it is hard to set up an inquiry that will pick out identifying relational clauses as effective on the same basis as effective ascriptive ones, effective mental clauses, and effective material clauses. The notion of external agency may still be valid ultimately for identifying examples such as *Al is the leader, Olivier plays Lear,* and *"Qahwatun" means coffee* and it may be possible to identify *Al, Olivier,* and *"Qahwatun"* as agents by means of the general inquiry identifying the agent of a clause; but we would certainly have to move to a more abstract notion of agency than the one that works for the other process types (including ascriptive relational clauses).[5] So we can set up the following network of inquiries.

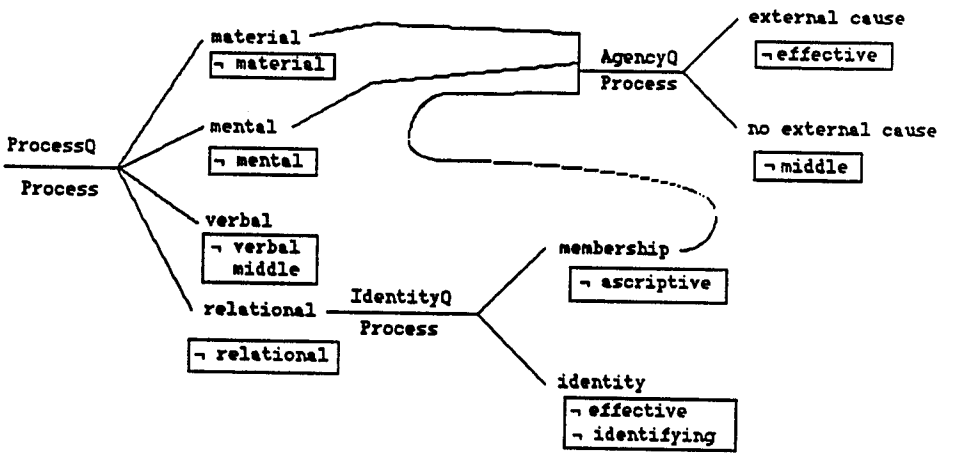


Fig. III:4-13: AGENCY and PROCESS TYPE - interaction

[5] This abstract notion might be along the lines of dominance: among relational processes, the 'agent' is the more dominant participant, the symbol rather than what is symbolized (i.e., signifier rather than signified) if the process is symbolic (meaning, representing, realizing, expressing, symbolizing, betoken, etc.), the possessor rather than what is possessed if the process is possessive (owning, possessing, etc.), and for instance the more inclusive participant if the process is a locative circumstantial one (surrounding, containing, spanning, covering, etc.). But these are interesting and revealing strong tendencies rather than exceptionless categories.

The network is set up so that the inquiries used to differentiate between effective and middle depend on the particular process type. Material, mental and relational processes of membership use AgencyQ. Verbal processes automatically preselect for middle and relations of identify for effective.

The inquiry network also allows us to handle interdependencies between PROCESS TYPE and CIRCUMSTANCE. For instance, different semantic classes of manner of favoured by different process types (cf. Dik, 1978: 35-6).

4.3.2 Transitivity metaphors

Certain transitivity metaphors can be handled by means of the version of the inquiry network introduced in this section. The strategy for handling the metaphors is the same as with the interpersonal ones discussed in the previous subsection: the preselection of the congruent realization is delayed, pushed further to the right, in the inquiry network by means of the addition of further discriminatory inquiries.

As a simple illustration, consider metaphors of mental reaction such as the following.

(congruent:) `I fear heights`

(metaphorical:) `I have a fear of heights; I'm afraid of heights`

(congruent:) `Power attracts Henry`

(metaphorical:) `Power has an attraction for Henry; Power is attractive to Henry`

These are represented congruently as mental clauses with a senser, a phenomenon, and a reactive process. The metaphorical strategy is to represent them by means ascriptive relational clauses. The reaction is represented as an attribute, which is ascribed to the senser as attribuend or to the phenomenon as attribuend.

To handle alternations such as these, we can add an inquiry to ascertain whether the reaction is to be represented as process or attribute (ReactiveAscriptionQ). This inquiry is presented once it has been established that a mental process of reaction is to be represented:

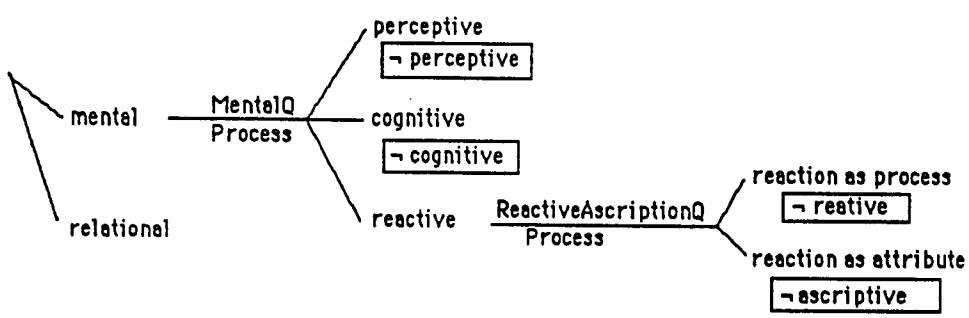


Fig. III:4-14: Metaphors of mental reaction

This sketch indicates how the metaphor can be handled by differentiation at the semantic level. It does not address the central question as to when reaction should be represented as process and when it should be represented as

attribute. There are clearly several factors involved. One of these is modifiability. The metaphcrical alternative opens up new possibilities, as in

```
I still have my old childhood fear of heights
```

We can try to build inquiries about these factors into the inquiry network or we can see them as being part of the planning needed to respond to the inquiries; see further Section III:6 below.

4.4 The logical and textual metafunctions

I have focussed on the inquiry network organization in the context of the interpersonal metafunction and the experiential subtype of the ideational one. As can be expected from the discussion of logical systems in Section II:3.2.4.6 and of textual ones in Section II:3.2.6.4, once the grammar is extended, the semantic interface will also have to be extended to deal with the dynamic issues that arise. I won't pursue this in detail here, but will only briefly mention one possibility that concerns textual choices in particular and relates to a topic raised in Section II:1.2.1.6.4 (iv).

Bateman et al. (1987: Section 4.3) explore the notion of situated choice, i.e., a choice which may vary depending on the context in which it occurs. They propose an extension to the set of chooser actions to allow one chooser to 'situate' another chooser by setting the response to it. For instance, if the chooser of the THEME SELECTION system selects a locative theme, it also sets the response to the LOCATION system to be 'location' so as to ensure the

presence of a Locative function to conflate with Theme. In other words, choosers can exchange information not only with the environment but also with one another. Given an inquiry network of the type discussed here, one might allow the inquiry concerned with thematicity to select in both systems, i.e. to select 'locative theme' as well as 'location'.

4.5 Traversal of inquiry network and system network

There are two overall steps in the generation algorithm sketched in Section II:1.2.1.6, viz. grammar entry and grammar traversal. I will begin by looking at what happens to the second step when the semantics is organized as a network of inquiries.

In the generation algorithm discussed above, grammar traversal is organized around the grammatical system network. Chooser activation and realization are stated in terms of traversal of the system network. This algorithm will work as long as the organization of the semantic stratum is stated in terms of the grammatical system network, as the chooser framework is. When a system has been entered its chooser can be activated and when the chooser has finished, the algorithm returns to the grammar again and moves to a new system.

In short, as long as the semantics is grammar-based, we can rely on a grammar-based generation algorithm. If we design a network of inquiries, the old grammar-based generation algorithm will no longer do the job, since it has no provision for inquiry organization beyond the chooser package and there is no longer a chooser package to be called into action from each system.

So what can be done to accommodate the inquiry network in generation? There are a number of different alternatives, but all of them have in common the strategy of 'raising' the process of network traversal to the semantic stratum: since the inquiry network is organized on the same principles as the grammatical system network, the same kind of traversal algorithm can be used. The alternatives differ in how they answer the following two questions.

(i) How are the generation algorithm and the semantic interface related to one another?

(ii) Assuming the traversal algorithm is 'raised' to the semantic stratum, what is the nature of the traversal of the grammatical system network?

(i) Generation algorithm and the semantic interface. The generation algorithm based on the grammatical system network and the inquiry network have one feature in common: they are both users of the grammatical system network. One uses it dynamically and the other uses it semantically. While the two kinds of use are distinct, the commonality of use raises the possibility of merging the inquiry network and the generation algorithm into a kind semantic procedure for generating with the grammar. This has the potential advantage of reducing the number of separate notations and giving semantics more procedural flexibility. At the same time, it runs counter to the policy of keeping resources (in this case, the inquiry network) and processes (the generation algorithm) separate so as to simplify the task of inverting the processes (cf. Section I:1.1). If the semantics were merged with the generation algorithm, it would be difficult to gain access to it in parsing. So, while noting the possibility of merging the two, I will assume that the semantic inquiry network and the generation algorithm are kept separate.

(ii) Traversal of grammatical system network. Assuming we use an algorithm for traversing the inquiry network, how is the grammatical system network traversed? We might retain a modified version of the current algorithm for traversing the grammatical system network. The modification would involve the removal of the activation of choosers and the addition of sensitivity to the semantic preselection of grammatical features. This addition would be quite similar to the treatment of grammar-internal preselections: to ensure that a preselected feature is actually chosen, the algorithm does backward chaining -- what we have called path augmentation -- from the preselected feature to the root of the system network before the network traversal starts so that the path to the preselected feature can be followed in the course of the subsequent traversal of the system network.

This approach assumes that the modified generation algorithm is still based on a forward chaining traversal of the grammatical system network. However, the preselections from the inquiry network should always fully determine which grammatical features are to be chosen, either directly or by path augmentation. This suggests an alternative approach: the forward chaining traversal of the grammatical system network (supported by path augmentation) can be replaced by a backward chaining one, i.e. a traversal algorithm based entirely on path augmentation. The task of this algorithm is simply to work out all the consequences of the fully deterministic preselections from the semantic stratum.[6]

[6] It is also possible to explore a generation method that alternates control between the semantics and the grammar. For instance, the semantics would assume control under certain conditions, such as the conditions of interpersonal metaphors of mood and modality, but otherwise control would rest with the grammar. I will not explore this approach here.

The figure below shows an abstract example of the path augmentation. The semantic stratum preselects the grammatical feature 'g'. This feature is the least delicate feature preselected on its path so the features it presupposes, features 'f', 'd', and 'a', are computed by traversing the system network backwards.

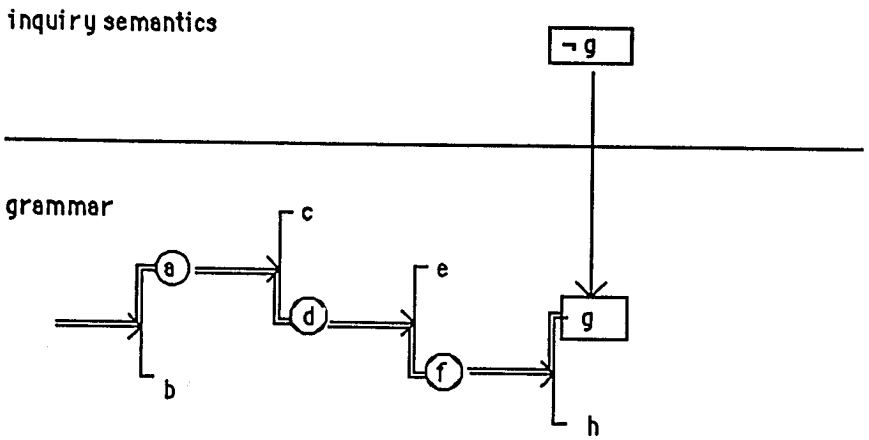


Fig. III:4-15: Path augmentation of choice of feature 'g'

This approach combining forward chaining in the semantic inquiry network with backward chaining in the grammatical system network is diagrammed below (cf. Figure II:1.2-34 above). The control of the generation algorithm has been moved up to the semantic stratum. The generation process is thus driven by the traversal of the inquiry network. At the grammatical stratum, it selects the grammatical features preselected and does backward chaining to select any features presupposed by the semantic preselections. As before, realization statements are activated when features are chosen.

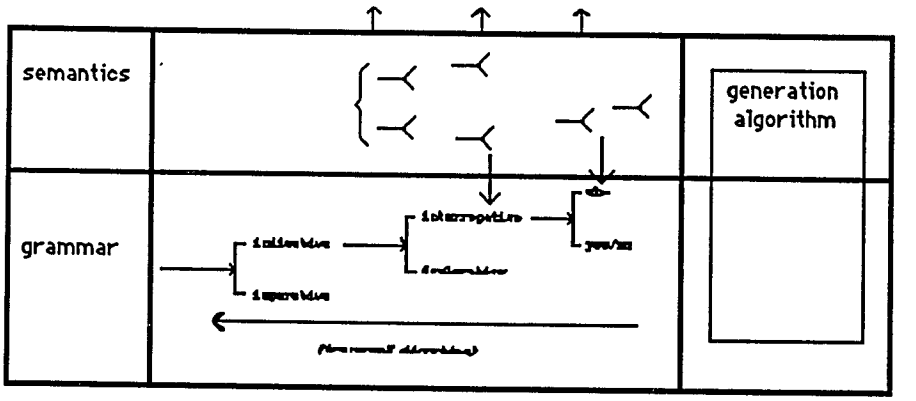


Fig. III:4-16: Semantically based generation algorithm

The backward chaining traversal of the grammatical system network is of particular interest if the grammatical features preselected from the semantics tend to be fairly delicate, since a large number of grammatical features will then be selected automatically by means of path augmentation. I will touch on this issue in Section III:6 in connection with situation-specific semantices.

The approach just hinted at is underspecified in a number of ways. There are two aspects of particular importance, (i) the sequencing of the grammatical and semantic traversals; and (ii) the question of what constitutes a traversal.

(i) On the question of sequence of the semantic traversal and the grammatical one, they might be sequenced so that the semantic traversal is started and runs to completion before the grammatical one is started. (As we have seen, this is how the current generation algorithm schedules multiple traversals within the grammar. Preselections are collected but they are not used until the relevant traversal cycle through the grammar is started.)

Alternatively, they might be interleaved so that the semantic traversal starts and the grammatical one is activated whenever a grammatical feature has been preselected. This approach is of particular interest in a parallel implementation of the generator. In principle, the result should be the same whether they are done in sequence or interleaved; but this needs to be examined in more detail, which I won't do here.

(ii) The other aspect of the underspecification of the semantically based generation algorithm is the issue of what constitutes one traversal cycle and how cycles follow one another. The situation is quite clear with the grammar-based algorithm of Section II:1.2.1.6: one cycle starts with 'grammar entry', ends with the complete specification of the current unit (clause, nominal group, etc.), and is followed by a new grammar entry unless all constituents have been specified lexically.

It would certainly be possible to retain this part of the control of the grammar-based algorithm. That is, the generation cycles would be determined by grammar entry and once the grammar had been entered the semantically based traversal algorithm would take over:

(i) grammar entry: the grammar is entered for each unit to be generated; each grammar entry is followed by a semantic inquiry network traversal; and

(ii) semantic traversal: the inquiry network is traversed, which entails preselections of grammatical features, path augmentation, and activation of realization statements.

Alternatively, the semantics could be given more control over the succession of traversal cycles. I will now explore this possibility.

5. Towards a network of inquiries (2): inter-rank

As we have seen, semantic control in the chooser and inquiry framework is local to the system of the grammatical system network. I have just explored the possibility of organizing inquiries more globally into a network. However, this network is still local with respect to another grammatical category, viz. rank: one traversal cycle of the grammar corresponds to the traversal of the inquiry network. In other words, I still retained the grammar entry part of the generation algorithm from Section II:1.2.1.6.

There are reasons to think that the semantic interface needs more global, inter-rank access to the grammar. Grammatical metaphor is again a central consideration.

5.1 Metaphors of modality; partitioned preselection

Let's return to MODALITY, the illustration used above in Section III:4.2. Assume that the proposition that Henry has left is to be modalized as being certain. As was mentioned above (Section III:3.2), there are four strategies open to us. The modality can be expressed either in the same clause as the proposition itself by means of a modal Adjunct (*certainly*) or a modal Finite

(*must*); or it can be expressed in a clause different from the one expressing the proposition (*I'm sure; it's certain*), in which case the two clauses form a clause complex:

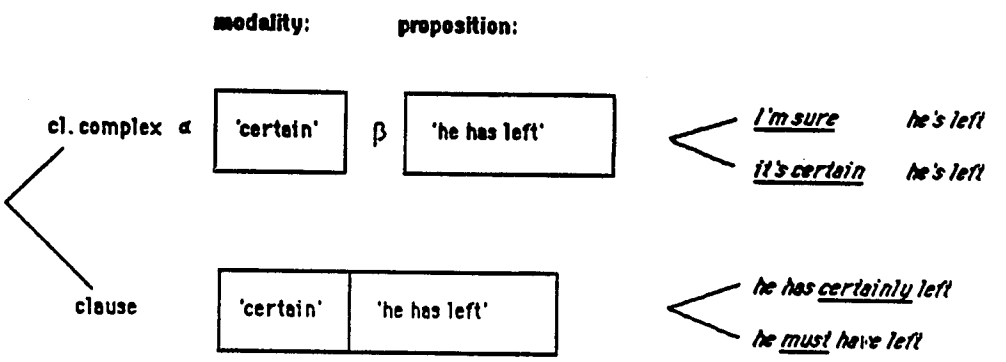


Fig. III:5-1: Expressions of certainty, metaphorical and congruent

Even with the inquiry network explored in the previous section there would be no way of coordinating the resources for expressing modality. However, if the semantic interface could refer to more than traversal cycle through the grammar, it would be able to choose between strategies involving a single clause as well as strategies involving a clause complex.

For metaphors of modality, we need to be able to refer to the clause as well as the clause complex: the starting point is the semantics and the particular choices will determine whether a clause or a clause complex is to be developed. In addition, we need to be able to refer to the elements of the clause complex, in this case α and β, so that they can be constrained by preselection.

As before, there are two simultaneous inquiries, ModalOrientationQ and ModalExplicitnessQ. Together they determine the use of clause and clause complex to express modality:

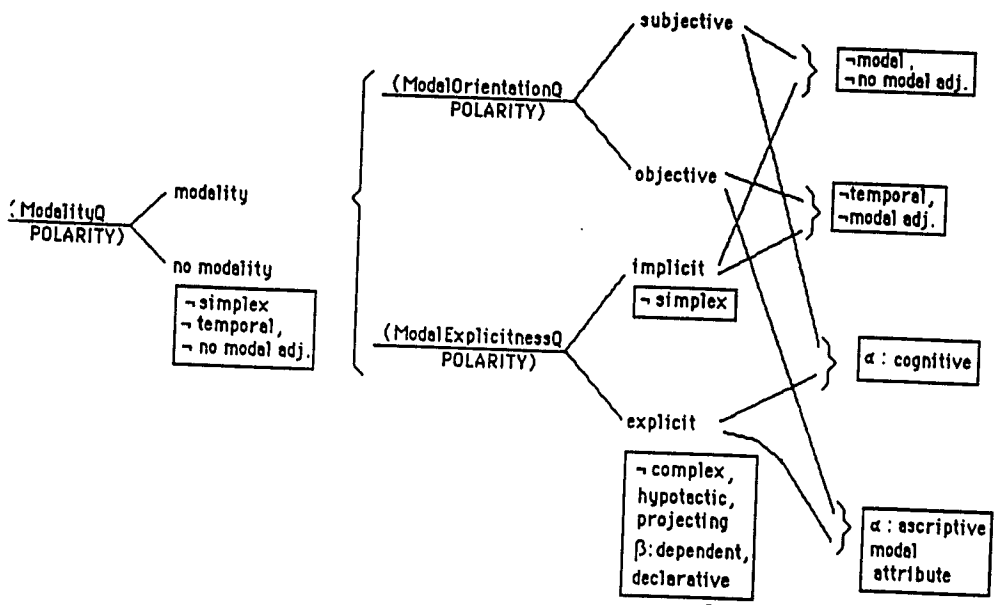


Fig. III:5-2: Modal options ranging over more than one unit

The example suggests that the semantics needs to be able to operate with more than one grammatical unit at any given time. If the semantics records realizations on a kind of blackboard, this simply means that this space has to be partitioned into subspaces, one for each grammatical unit that the semantics makes reference to. For instance, if the modality is explicit rather than implicit,

the blackboard has to be partitioned into one space for the clause complex and two for the clauses combined. The clauses are identified in terms of the structure of the clause complex (α β):

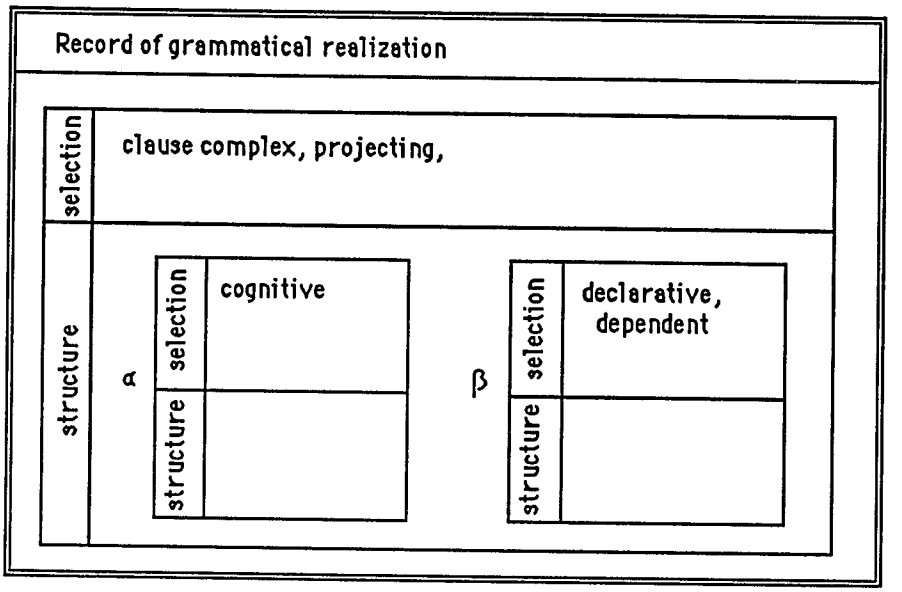


Fig. III:5-3: Partitioned preselection

In general, the strategy is to give more internal organization to the way in which the semantics predetermines choices in the grammar. Instead of operating only with a single set of preselections, we operate with multiple sets and the structural specifications needed to differentiate these sets.

The other type of interpersonal metaphor discussed above, metaphors of mood, require the same kind of mechanism: like metaphors of modality, metaphors of mood may involve clauses as well as clause complexes. I will exemplify them briefly now.

5.2 Metaphors of mood

Interpersonal metaphors of mood serve to increase the number of speech functional options. For instance, in addition to congruently expressed demands for information (questions) or goods & services (commands), there are tentative ones, achieved by means of grammatical metaphor. The metaphor may involve a simple clause with a non-congruent mood selection, as in the case of a command expressed as a question (cf. the example in Section III:4.2 above). But it may also involve a shift from a simple clause to a clause complex: a question may be expressed metaphorically as a projecting interrogative clause complex to indicate tentativeness on the part of the speaker; for instance:

'direct'

Is Sunday still on?

'tentative'

<u>I wonder</u> if Sunday is still on?
<u>I wondered</u> if Sunday is still on?
<u>I was wondering</u> if Sunday is still on?

As long as the inquiry network can preselect for clause features as well as clause complex features, there is no problem in stating the realizations of a 'direct' question as opposed to a 'tentative' one, as in the network fragment below:

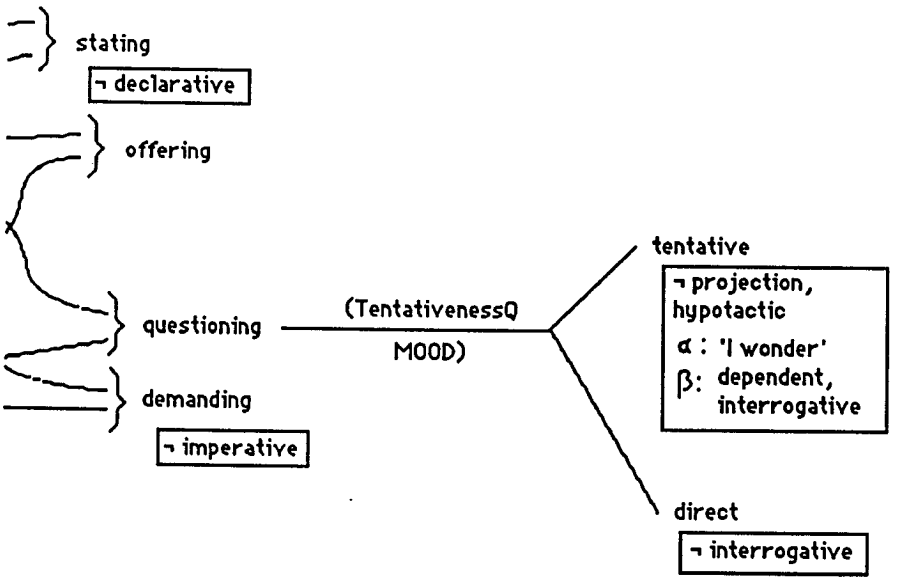


Fig. III:5-4: Interpersonal network of mood metaphors

~*~*~*~

This brief illustration of an interpersonal network of mood metaphors concludes the discussion of extending the inquiry part of the chooser and inquiry semantic framework in the direction of networks of inquiries. The considerations involved in the exploration of inquiry networks have been both internal to the semantic level itself and directed downwards, towards the grammatical level. I will now turn to another aspect of the task that a semantic interface has to deal with, viz. the interface upwards, towards context.

6. Looking upwards towards context

At the outset of this chapter, I contrasted two approaches to semantics as an interlevel, one from grammar and one from context; see Figure III:1-1. The starting point for the chooser and inquiry framework is the grammar: it is a grammar-based type of semantics. However, I have now explored two steps in disassociating this semantic interface from the grammar. The first step was to suggest an independent, global network of inquiries and the second step was to allow the interface to refer to more than one rank. Giving the interface greater freedom from the organization of the grammar opens up the possibility of more influence from above, from context, on the organization of the interface. There are at least two directions in which we can take the inquiry interface:

(i) we can allow it to specialize according to different contexts of use -- the semantic categories would then be semanticizations of contextual categories to a greater extent; and

(ii) we can move it closer to planning considerations so that it becomes more of a strategic level -- the organization of the semantics would be more of a strategic one and less of a discriminatory one.

These directions are far from mutually exclusive, but it will be easier to look at them one at a time. I will discuss the first direction in this section and then turn to the second in Section 7.

6.1 From above & from below: encoding & decoding

There are two stratal approaches for exploring the organization and categories of semantics. (i) We can explore it from above, from outside the linguistic system -- what might be called an **encoding** approach since it looks at semantics as an encoding strategy and explores how contextual categories are encoded semantically. (ii) Alternatively, we can explore semantics from below, starting with lexicogrammar -- what might be called a **decoding** or interpretive approach, since it works by decoding or interpreting lexicogrammar in semantic terms:[7]

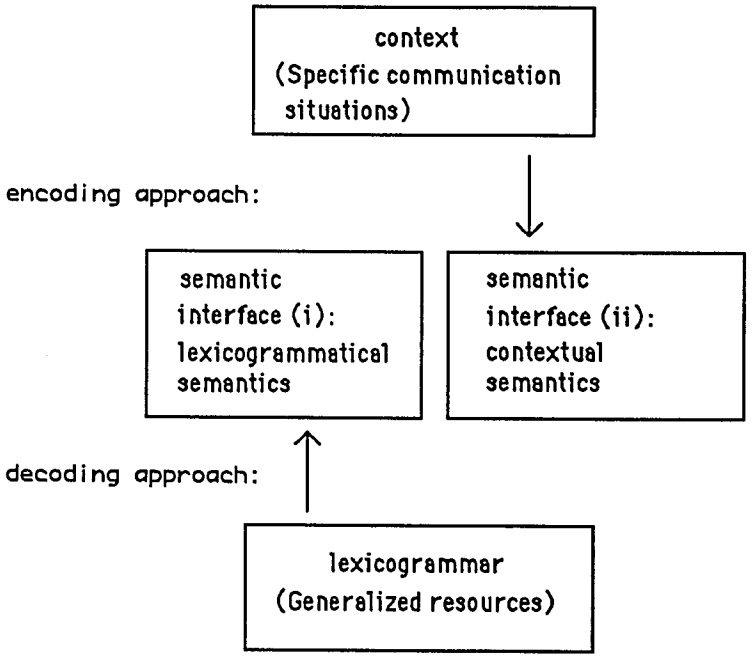


Fig. III:6-1: Approaching semantics from above and below

[7] The two directions pertain to the design of the semantics, not to the direction in the flow of control. Encoding and decoding are thus not to be equated with generative and interpretive semantics. Both generative and interpretive semantics are essentially decoding in that they reflect the categories of grammar rather than contextual categories.

(i) Decoding approach: grammar-based semantics. We can explore semantics from below, starting with lexicogrammar. This technique was used in ancient Greece; it is the technique of traditional grammar. It also survives in interpretive semantics in modern linguistics. The basic question is "what is the interpretation of the grammatical category x; what does x signify?". Clearly, the semantic results will depend crucially on the nature of the grammar that is taken as a starting point. Since traditional grammar is *word-based*, 'x' is a characteristic of the word and the interpretive question is typically applied to inflectional categories such as case, number, mood, and tense/aspect. However, if we apply the technique to a systemic grammar, the results will be different, because the grammar is *clause-based*, it is multifunctional, and has a paradigmatic base: we get a multifunctional choice-semantics. The system in the grammatical system network is the locus of control in **chooser and inquiry semantics.**

(ii) Encoding approach: contextual semantics. The encoding approach takes context as its starting point and brings the communicative purpose into focus. The semantics constitutes the strategies for achieving communicative purposes in context. There are, in principle, two ways of setting up a contextual semantics:

(a) we can set up different semantic systems for different contextual configurations -- i.e., we take a particular context of situation as a given, and set up a semantics for it; or

(b) we can organize the semantics as a way of exploring the various possible values of the contextual variables field, tenor, and mode -- i.e., the

semantics is set up to identify (aspects) of the context of situation.

I will deal with the first alternative in the bulk of this section and will then return to the second one in Section III:6.9. An example of approaching semantics from above is what Halliday has called **socio-semantics** (cf. Turner, 1973; Halliday, 1973: cf. 4 and 1978). For example, if a mother wants to prevent her child from playing in a dangerous place, that is, if her goal is prevention, what can she do semantically -- what can she mean? From this perspective, meaning is one type of purposeful behaviour, a symbolic way of achieving some purpose: "for the purpose of controlling the behaviour of a child" its mother may "elect to adopt linguistic measures" (Halliday, 1973: 65).

Before moving on let me just note that while it is useful to contrast the two approaches to semantics, it is important not to take them to imply that contextual categories exist prior to and independently of language. The linguistic system and the higher-order contextual systems are mutually interdependent. The two approaches are essentially different perspectives on the semantics. Indeed, in Chapter IV, I will push the movement originating with the lexicogrammatical systems even further and explore what they can tell us about context.

6.2 Specificity of semantic categories

The direction from which the semantic interface is approached tends to determine the degree of specificity of the semantic categories. Since the approach from above takes context as its starting point, it is likely to yield ***situation-specific semantic systems:*** we project a variety of different uses

onto semantics, giving us semantic interpretations of contextual categories; for example, 'behavioural control of child' is semanticized as 'appeal to authority figure', 'threat of physical punishment', 'threat of loss of privilege', and the like, whereas 'behavioural control of student' is semanticized as 'warning about fees', 'threat of expulsion from programme', and the like. The notion of function reflected in this kind of semantics is thus use in context and there will be a large number of different uses.

Since the approach from below takes one highly generalized system -- lexicogrammar -- as its point of departure, it is likely to yield ***one general semantics:*** we project the general categories of grammar such as 'declarative' and 'imperative' onto semantics and posit semantic correlates such as 'statement' and 'command'. The notion of function reflected in this kind of semantics is thus the highly generalized notion of metafunction.

To illustrate the contrast in specificity between the two approaches a bit further, we can extend the examples involving control and mood. Imagine, for the sake of illustration, three registers: control of child, persuasion of consumer to buy product -- advertising, and instruction of non-expert by culinary expert in food preparation -- recipes. In the context-based approach, each of these would lead to a register specific semantics, the semantics of child control, the semantics of advertising, and the semantics of recipes, each of which would have a specific set of 'speech acts' or 'speech functions'. The semantics of control would be concerned with warning and threatening, the semantics of persuasion with claiming, impressing, and enticing; and the semantics of instruction with informing and instructing.

If we follow the approach from below, we would, in contrast, create a grammar-based semantics of mood, i.e., speech functional options such as statement, question, and command, as in traditional grammar.

The two approaches are summarized diagrammatically below.

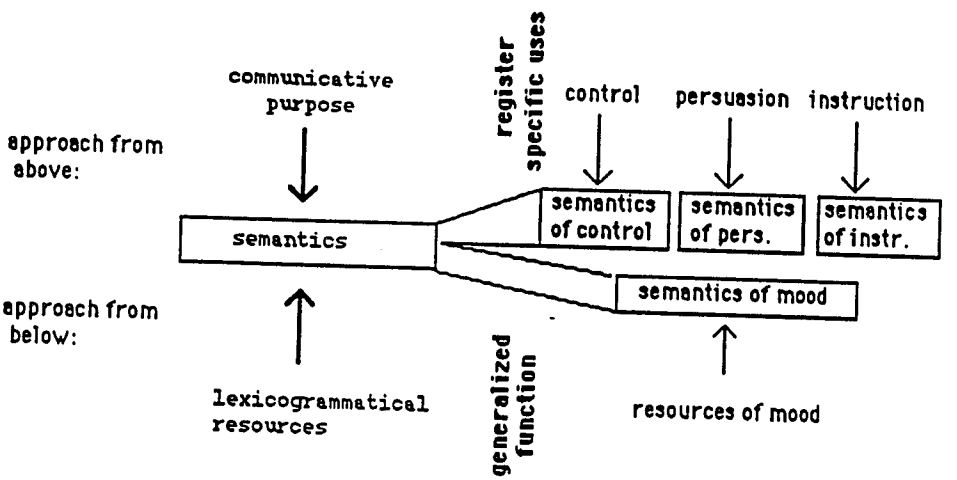


Fig. III:6-2: Two directions in exploring semantics

One central question is thus: how will the two approaches meet -- is the result one semantic stratum or two strata. As a working hypothesis, I think it is better to assume that there is one stratum and that the differences are ***differences in delicacy and not differences in stratal abstraction.*** However, extensive descriptive work is needed before we can choose with reasonable certainty.

The differences between the two directions in the approach to semantics are summarized below.

direction	starting point	'function'	
encoding	context	large variety of specific uses	semantic restatement of contextual categories
decoding	lexicogrammar	small number of generalized metafunctions	semantic restatement of lexicogrammatical categories

Fig. III:6-3: Semantics from above and from below

6.3 Motivation for approaching from above: bridging and compilation

There are at least two basic types of motivation for exploring and writing context-based semantic systems, (i) bridging and (ii) compilation:

(i) Bridging. The orientation towards context serves to bridge the gap between linguistic categories and higher-level categories. Within sociology, Halliday's concept of semantics is motivated partly because it can act as an interface between language and the rest of the social system. Turner (1973: 195) comments

> [Halliday's of meaning potential] should enable researchers to integrate sociological concepts and linguistic concepts. The sociological theory identifies the socially significant meanings. Once these are specified, their grammatical and lexical realizations are also capable of specification.

Within computational linguistics and AI, it is possible to make similar observations: situation-specific semantic systems may serve to relate non-linguistic categories to linguistic ones.

(ii) Compilation. Furthermore, a situation-specific semantics can be seen as a set of strategies developed to deal efficiently with the specific, limited set of communication problems inherent in that context of situation. We can find this consideration in computational linguistics and AI. Patten (1986) has shown that the approach of situation-specific semantics can be motivated in AI terms as well as in linguistic terms. Patten treats text generation as problem solving and shows that there is a striking similarity between the AI problem-solving framework and Halliday's systemic approach to language. The similarity is all the more interesting because the two traditions have developed independently of one another.

The lexicogrammatical system network can be seen as the space of inter-related alternatives for solving a communicative problem. There are different ways of searching the system network for appropriate feature selections. One way is to traverse the network from left to right and to reason about each systemic alternative by means of choosers (cf. Figure III:1-5 above). Patten argues that it is potentially costly to do this kind of reasoning from basic principles. Another way is to rely on a strategy that has already been developed for a particular problem ("compiled knowledge") and this is what Patten takes a situation specific semantics to be. That is, for a given register there is a particular semantic strategy for traversing the lexicogrammatical system network. If we are faced with a novel generation task which does not

correspond to a recognized register, we will have to revert to basic principles.

6.4 An example: a semantics of control in a regulatory context

Let's consider an example of the semantics of a particular register. Assume that we are building a generator for mother-child control, the situation Turner (1973) did sociological research on, Halliday (1972/3) uses as an example of sociological semantics, and Patten (1986) takes over for text generation.[8] The situation is the following (Halliday, 1973: 65):

> [A] small boy has been playing with the neighbourhood children on a building site, and has come home grasping some object which he has acquired in the process. His mother disapproves, and wishes both to express her disapproval and to prevent him from doing the same thing again.

The question is what her linguistic strategies are. The answer lies in the semantic system network; most generally, she can threaten or warn her son. What we have, then, is a semantics of a certain type of behavioural control for one of the four critical contexts of socialization used by Bernstein (1971: 198)[9] -- the regulative (regulatory) one:

---

[8] We might undertake this project to test the model, possibly as a pilot for future work. The computer would simulate the mother. In other text generation situations, such as expert system explanation, the computer's social role is more likely to be that of a computer.

[9] He draws on Halliday's (cf. 1973) work in identifying them. He characterizes them as follows: "(1) The regulative contexts: these are the authority relations where the child is made aware of the moral order and its various backings. (2) The instructional contexts: here the child learns about the objective nature of objects and acquires various skills. (3) The imaginative or innovating contexts: here the child is encouraged to experiment and re-create his world on his own terms and in his own way. (4) The interpersonal contexts: here the child is made aware of affective sates - his own and others." Bernstein goes on to comment: "I am suggesting that the critical orderings of a culture or sub-culture are made substantive, are made palpable through the form of its linguistic realizations of these four contexts - initially in the family."

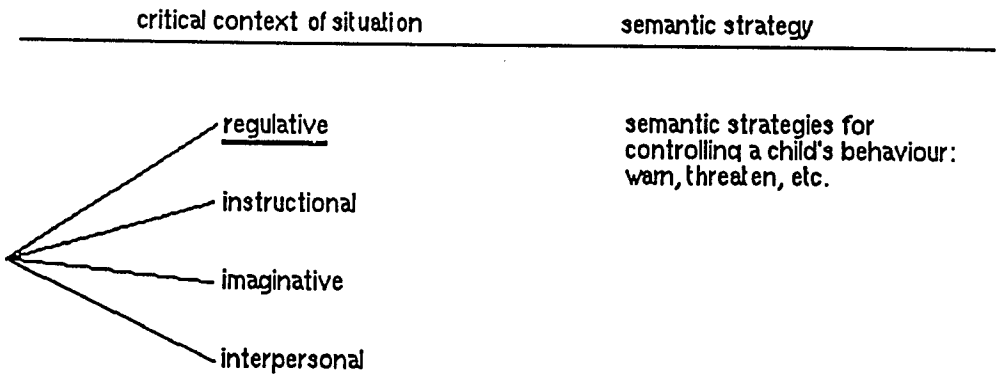


Fig. III:6-4: Critical contexts of situation and regulative semantics

The two basic regulatory strategies are threatening (with punishment or restraint) and warning (about what will happen to the child or the child will cause to happen). Examples of texts include

threat

```
if you do that again I'll smack you
Daddy'll be cross with you
you do that again and you'll get smacked
```

warning

```
you'll get hurt
you'll get your feet wet
you'll tear your clothes
```

The semantic network consists of systems like threat / warning, physical punishment / mental punishment / restraint on behaviour, and so on. Part of the semantic system network discussed in Halliday (1972/3: 81) is given below (only the category of threat is further elaborated in delicacy).

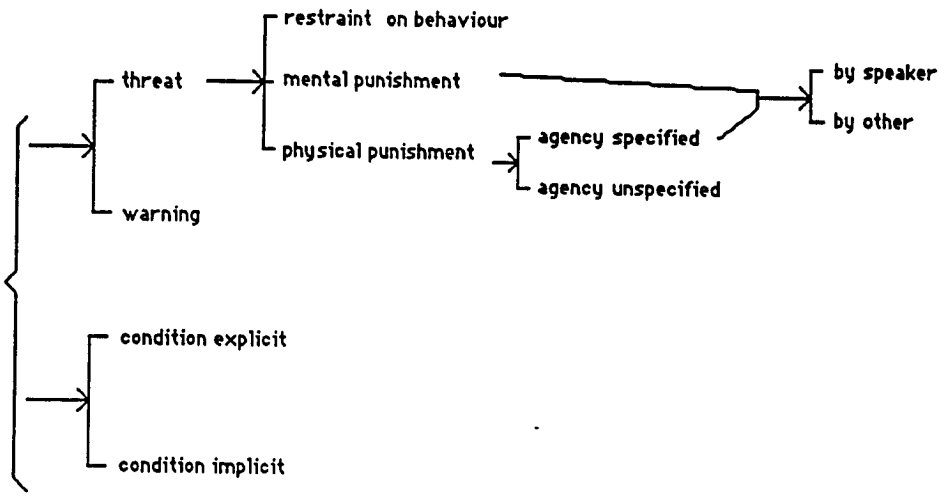


Fig. III:6-5: Fragment of regulatory semantics

Semantic features are realized by preselections of grammatical features. For example, the semantic feature 'threat' is realized by selection of the grammatical feature 'declarative'. In general, delicate grammatical features are preselected and the less delicate features they presuppose can then be chosen automatically by moving from right to left by backward chaining in the system network rather than by explicit preselection, as outlined above in Section III:4.5. This method makes good use of the 'logic' of the lexicogrammatical system network; see Figure III:6-6 below.

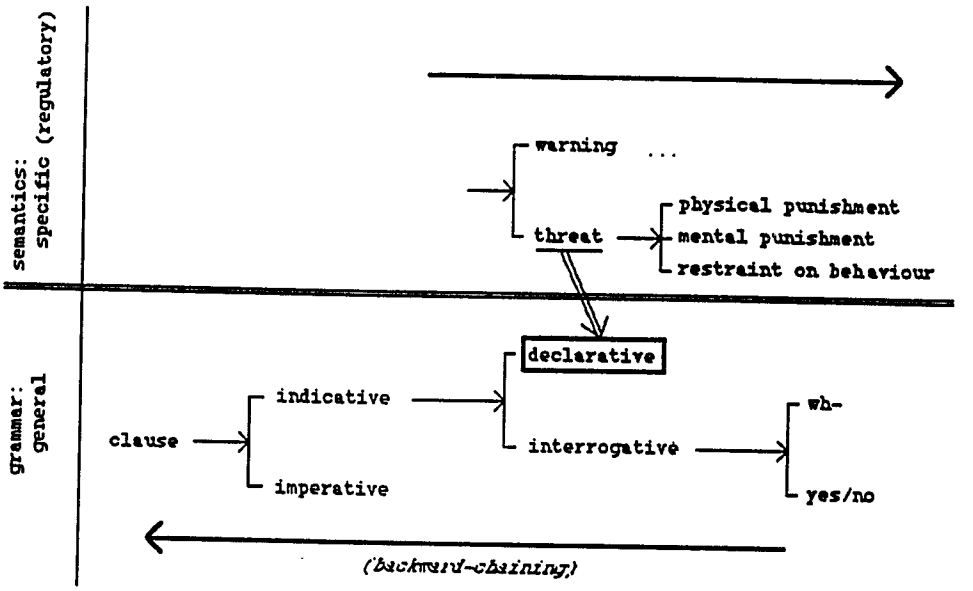


Fig. III:6-6: Generation with situation-specific semantics

(The features from the more delicate systems, reachable from the feature 'threat' are realized not by mood selections but by selections in transitivity and voice. Given a specific situation such as the regulatory one, we can expect this kind of integration in the situation-specific semantics of metafunctional considerations.) The interface to lexicogrammar is organized from above, from the semantic stratum. This kind of approach is, in Halliday's terms (p.c.), a 'charger' approach to the interface rather than a 'chooser' approach.

As the diagram indicates, there is a tendency for the situation-specific semantics to be more delicate than the non-specific lexicogrammar. This is to

be expected, particularly in the fairly restricted registers that have been attempted in text generation: only a restricted subset of the lexicogrammatical resources will be employed and the semantics can simply 'turn off' certain parts of the grammar by never preselecting grammatical features in these parts.

To extend Patten's line of research further within text generation, it is important to describe the semantic systems of a variety of situation types; for instance, Marilyn Cross, at Macquarie University, is currently working on descriptions of the water cycle for different addressees. There is good reason to think that the approach of situation-specific semantic systems will yield interesting results. The types of situation for which we can attempt to write semantic networks would also seem to be the types that can be addressed in text generation at present.

Now, the example of regulatory semantics has been discussed in terms of a network of semantic systems such as threat / warning. To relate these systems upwards, we can easily turn them into inquiries. For instance, the system threat / warning can be re-represented as an inquiry concerned with the basic strategy of control: is the child to be controlled by appealing to authority, by threatening him with punishment or restraint on behaviour if he carries on; or by appealing to the dangers of the world, by warning him that his behaviour will harm him? Similarly, the strategy of threatening can be further differentiated by means of inquiries:

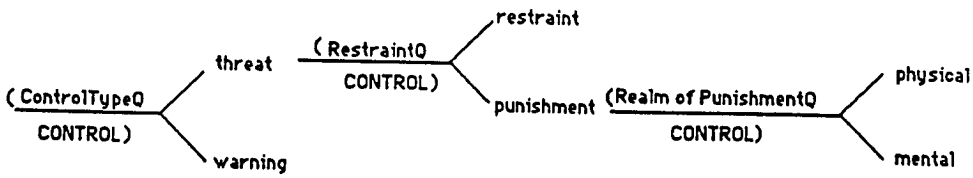


Fig. III:6-7: Semantic system network as inquiry network

Since the grammatical realizations include single clauses as well as clause complexes, a regulatory inquiry network will be of the type discussed in Section III:5, i.e., it will range over more than one grammatical unit.

6.5 The 'image' of lexicogrammar from semantics

The preselections of lexicogrammatical features in a semantic network such as the one for control represent an 'image' of the lexicogrammar for a particular register. That is, while the semantics draws on the general lexicogrammar, it employs only specific parts. This projection of an image of the register-specific semantics onto the general lexicogrammar through preselections takes us back to the discussion of register-specific grammars and general coverage in Chapter II.

To see in some more detail what the projection of the semantics onto the general grammar is like, let's consider the grammar of clause complex, again using the example of regulatory semantics. The resources of the clause complex come into play when the condition under which the threat or warning

operates is made explicit, as in the following examples (Halliday, 1973: 77):

I'll smack you if you do that again

I'll smack you if you go on doing that

You stop doing that or Daddy'll smack you

You do that again and Daddy'll smack you

The relevant part of the semantic network is represented below with preselections of features from the grammar of the clause complex.

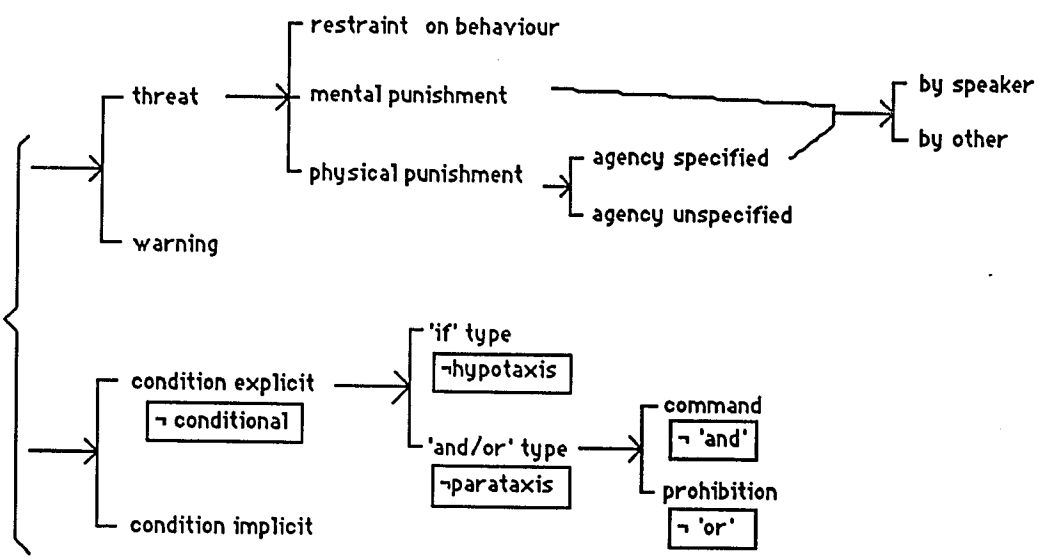


Fig. III:6-8: Semantic network with clause complex preselections

The resources of clause complexes were discussed in Sections II:2.2 and II:2.4.2. Here we can represent part of the general grammatical system network. Features preselected from the semantics of control are underlined.

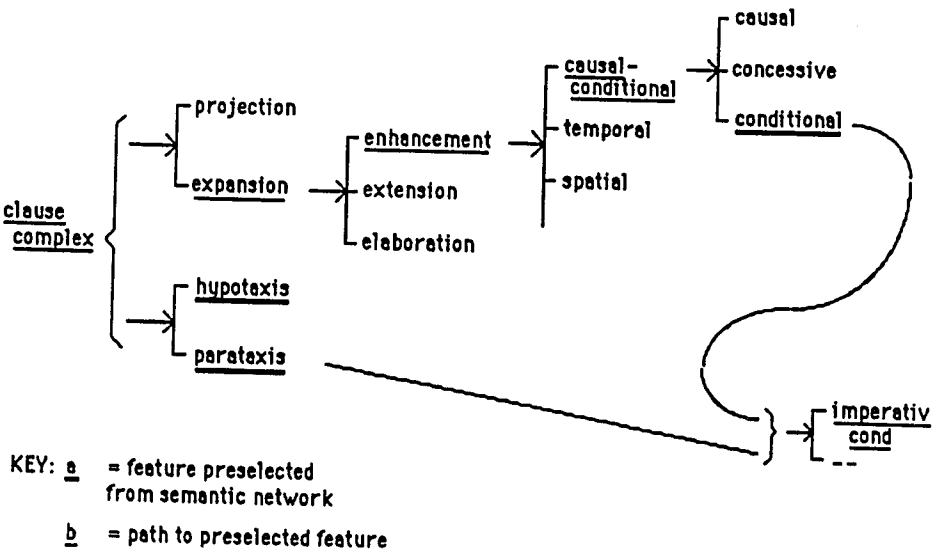


Fig. III:6-9: Semantic image projected onto grammatical network

As underlined preselections in the grammatical network illustrate, only a small part of the clause complex resources are used: condition, either hypotactic or paratactic. These preselections represent *the semantic use of the grammatical network* in a regulatory context -- *the semantic image projected onto lexicogrammar.* If we were addressing only this task, we could, of course, customize the grammar to cover only the semantic projection.

6.6 Register and semantics vs. grammar

The notion of projections of situation-specific semantic systems takes us back to the discussion of grammatical coverage and register in Section II:2. We can

now contrast the approach of a register-specific, customized grammar with that of a general grammar working with register-specific semantic systems.

For an area of illustration, I will return to TENSE, which was discussed earlier in Section III:2. The semantic distinctions I posited for the English TENSE system in that section are all highly generalized and they are derived from the grammatical system itself. They are important because they bring out the general principles of temporal representation embodied in the system of TENSE. At the same time, this generalized semantics of tense does not relate to particular uses of tense nor to specific contexts of use so it leaves a gap in the account.

The approach taken in traditional grammar was to list uses for each grammatical category and we can, of course, try to capture these lists in a tense chooser by defining inquiries corresponding to the various categories of use. One of the problems with this approach is that it gives us a fragmented picture with lists of uses for each separate tense; it fails to give us a systemicized account that can relate the *system* of tense to particular contexts of use. It also fails to show whether particular uses of different tenses are related in any systematic way. One symptom of this failure is the problem with a certain kind of tense alternation.

6.6.1 Problematic alternations

Neither the approach of a generalized semantics of tense nor the traditional method of listing uses for each individual tense allows us to account in a principled way for why certain tense selections alternate under certain conditions but not under others; for example:[10]

(i) future ~ present

The result of all this diligence was an enormous book, which, as we *shall see* later, was publicly burned on a beautiful spring morning in the great square. (TW 11)

Both of these types *are* briefly *discussed* later. (Halliday, 1970)

(ii) past ~ present

The ancestor of the dinosaur *is* the thecodont. ... Hesperosuchus is one example. The duckbill dinosaurs *were* among the later types of dinosaurs. (Dinosaurs)

Similarly, we cannot account for why there is sometimes alternation between the imperative and the indicative with tense selection:

You are now about to enter the heart of the Forbidden City.

After you *pass* through the gate you *will enter* an even larger courtyard, and in the distance before you, resting on a three-tiered terrace each surrounded by a white marble balustrade, is the Tai He Dian, or Hall of Supreme Harmony. As you *walk* towards it, *note* the three flights of stairs to the upper terrace: ... (Fodor's Beijing 11)

[10] Cases such as these have, of course, often been mentioned. For example, Pickbourn (1789: 32-4) notes the alternation between the simple past and the past-in-present e.g. in comments on artists and their work. The point I want to make is that the traditional method does not give us the basis for a principled treatment of the system.

We can approach the problem either through grammar or through semantics. Only the latter approach will work, but it is useful to look briefly at the former. The grammatical path to a solution to these problems is illustrated by an analysis Benveniste has suggested for French.

6.6.2 Approach through the grammar

Benveniste (1959) argues that what has traditionally been regarded as one tense system in French should be broken down into two *systems:* [11]

> Les temps d'un verbe français ne s'emploient pas comme les membres d'un système unique, ils se distribuent en *deux systèmes* distincts et complémentaires. Chacun d'eaux ne comprend qu'une partie des temps du verbe; tous les deux sont en usage concurrent et demeurent disponibles pour chaque locuteur. Ces deux systèmes manifestent deux plans d'énonciation différents, que nous distinguerons comme celui de l'*histoire* et celui du *discours*.

The two tense systems are typically distinct sets of tenses. When there is overlap, a special use can be assigned to the tense. For example, the present, *le présent,* belongs to the second tense system, but it can be found as an exception in the first historical system, in which case it is an atemporal present, *le 'présent de définition'*. The two tense systems correlate with two different personal pronominal systems:

[11] He focusses on these two but also mentions a third, found in indirect discourse.

	histoire	discours
tense system (basic)	aoriste * imparfait plus-que-parfait	parfait présent futur
pronominal system	3rd person	all persons

* = passé simple / passé defini

Fig. III:6-10: Two grammatical tense systems in French

Benveniste's observations throw light on the use of tenses and grammatical *systems* in general. It is possible to make similar observations about English. However, there are a number of different tense systems -- more than two or three. If we just consider *primary* tense, it is possible to identify five systems, viz. two one-term systems, two two-term systems, and one three-terms system. We find the three-term system in e.g. informal spontaneous conversation. The other systems can be seen as reductions of it, used in more restricted registers:

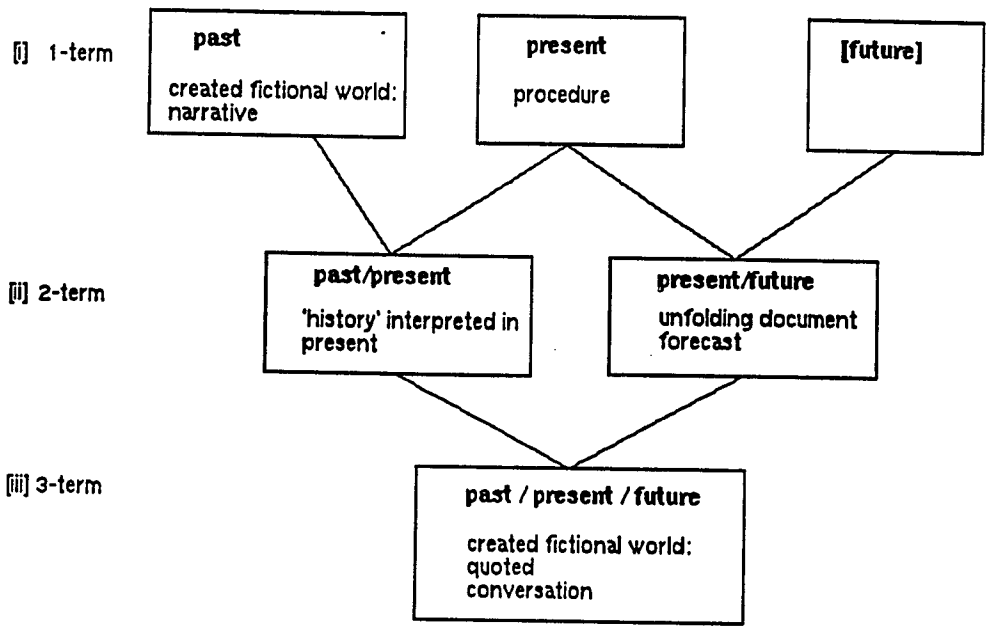


Fig. III:6-11: Five tense systems in English seen from PRIMARY TENSE in the grammar

When we also consider *secondary* tense, the number of different tense systems will obviously increase. Furthermore, the correlation between tense and person which Benveniste pointed to is a general phenomenon: we could posit different tense systems in the environment of different transitivity systems, different systems of temporal circumstance, different system of modality, and so on.[12] The systems above are stated in grammatical terms, but if we treat them as different grammatical systems, we would end up with a large number of different grammars and would miss all the generalizations embodied in a

[12] The scope of the correlations will, of course, increase if we do not restrict ourselves to categorial correlations but also take note of probabilistic ones.

unified grammar. That is, while the notion of different grammatical systems of tense is a useful heuristic, what we really have are a number of different uses of the same tense system in different contexts of use.

6.6.3 Different tense semantic systems

There is, then, a fundamental theoretical question that we have to address: how do we account for functionally differentiated subsystems of the kind Benveniste identifies? I think the answer lies in Halliday's theory of sociological semantics, according to which different situation types have different semantic systems. That is, rather than setting up different *grammatical* systems of tense, we can reinterpret Benveniste's observation by setting up different *semantic* systems of tense as part of different situationally determined semantic systems. Contextual differences are reflected in semantic differences. Different contexts of use correspond to different semantic strategies and each semantic strategy may constitute a different use of the grammar of tense, more or less restricted depending on the communication demands embodied in the context. This approach can be diagrammed as follows.

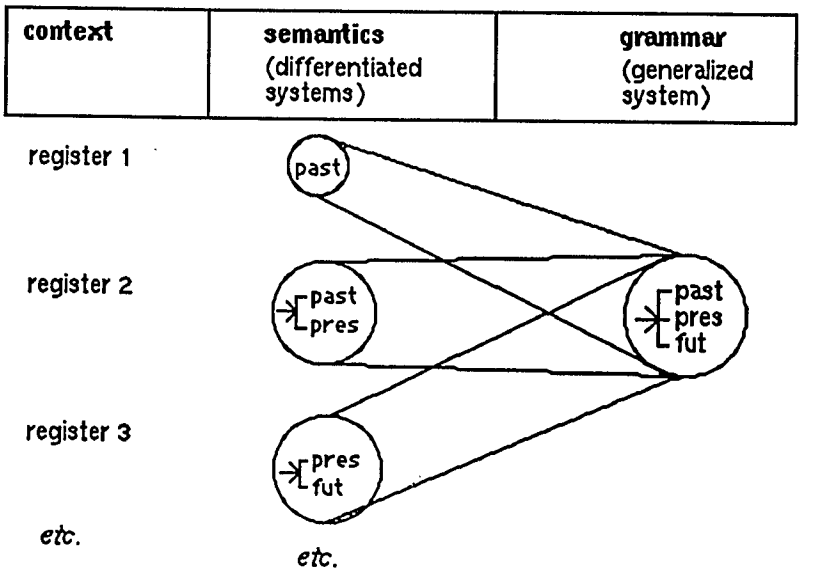


Fig. III:6-12: Different semantic tense systems for different registers of use

This semantic approach will be more revealing than the grammatical one. For example, one of the restricted grammatical tense systems identified above is present / future. However, semantically, there are, in fact, several systems operating in different contexts.

6.7 Text semantics

Although the systemic semantics used by Patten (1986) is context based, the texts that can be generated do not extend beyond the clause complex. The question is how we can enable a text generator to organize and produce more extended text. The answer will depend partly on what kind of semantics we use, (i) a grammar-based semantics or (ii) a context-based semantics.

(i) The chooser and inquiry approach to semantics is, by definition, grammar-based. It cannot deal with matters of text organization except from the vantage point of the grammar. That is, it can be used to control textual lexicogrammatical resources -- resources for achieving cohesion, thematic resources, and so on -- but it cannot deal with text organization as it is captured by generic structure potential or schematic structure; or exchange structure in systemic theory. It will go only as far as grammar, which is to say it will go as far as the clause complex. Consequently, the ability to organize extended text has to come from outside semantics, which is what has happened within the Penman project. Text organization is handled by a rhetorical component using Rhetorical Structure Theory (RST) and not by semantics.

(ii) When we approach semantics from context rather than from grammar, there is, however, every reason to expect a **text semantics** rather than only a lexicogrammatical semantics -- i.e. a semantics that is concerned with text as a semantic unit, the basic unit of communication. As already suggested, the published examples of situational semantic systems such as Halliday's semantics for mother-child control have dealt with communication tasks where it is possible to state the realization of semantic choices directly in terms of grammar without the intermediate step of a statement of semantic structure: it is, in a sense, not necessary to go beyond clause complexes such as *if you do that again I'll smack you* to realize the semantic strategy of a conditioned threat. When we address less restricted contexts in generation, it is "almost certainly going to be necessary to build in some concept of semantic structure" (Halliday, 1974 / 1978: 41).

To develop the notion of text semantics further, we would need to examine proposals for how to organize text, since they would provide us with structures we can interpret as text semantic structures. The two types of approach that have been developed for text generation are (i) McKeown's Rhetorical Schemas (McKeown, 1982, 1985; Paris & McKeown, 1987) (ii) and, within the Penman project, Rhetorical Structure Theory (see e.g., Mann & Thompson, 1987; Matthiessen & Thompson, 1988). As has already been suggested (Section I:2.2), McKeown's work is very similar to systemic work on generic structures by Hasan (1978, 1984, etc.) and others. I will focus on the latter since it is part of a theory of context.

(i) Generic structure as semantic structure. Let's first briefly consider generic structure as text semantic structure. Like sociosemantics, generic structure is a theory of register- (genre-) specific organization. According to it, texts are structured as advertisements, nursery tales, thesis defenses, service encounters, and so on. The alternative structures that are available within a genre are stated in terms of the structure as the generic structure potential of the genre. This potential specifies optionality as well as ordering. It is assumed that the structure realizes contextual choices -- choices within field, tenor, and mode. These correspondences have not been described in any detail yet, which leaves open the possibility of moving generic structure from the level of context to the level of (text) semantics, at least for certain purposes:[13]

[13] The move is more problematic in registers where text is ancillary to action and the generic structure is the organization of this action and in registers where the generic structure is realized also by semiotic systems other than language. Another important consideration is the question of how the elements of generic structure are realized. Hasan (1984) shows that the elements of a nursery tale are realized semantically rather than being realized directly by lexicogrammar. However, we can also explore the possibility that this realization is a movement in rank within semantics: the elements of generic structure are realized by semantic units of a lower rank, which in turn are realized lexicogrammatically.

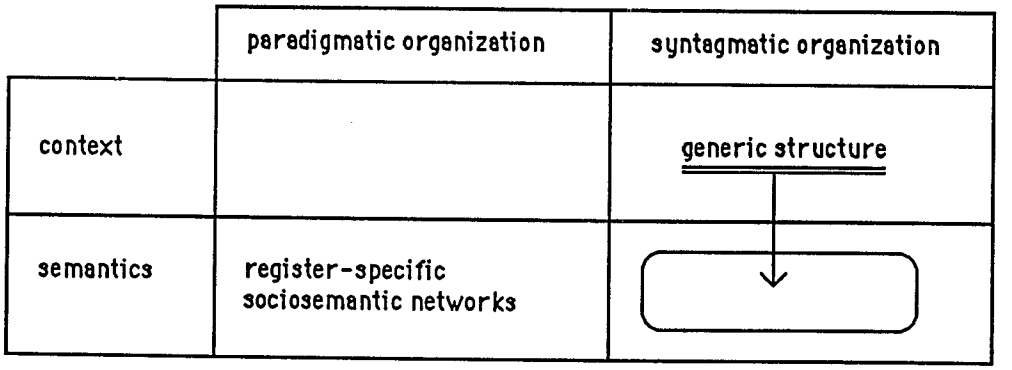


Fig. III:6-13: 'Borrowing' generic structure for semantics

For instance, we can add a structural component to the regulatory semantics on the model of the clause: the semantic options will be realized by the insertion of multivariate functions, the ordering of them, and the preselection of them to have certain grammatical features. For example, we can say that control exercised by warning or threat is realized by an element Prediction, which represents a situation that is undesirable to the child -- *I'll smack you, Daddy'll get cross with you, you'll fall down,* etc.. It is realized by a declarative clause, simple future, material or relational transitivity, and so on in more detail. The control may be explicitly conditional, in which case there is an element Behaviour -- *[I'll smack you] if you do that again, you do that again [and I'll smack you],* etc.. It represents the child's continued or repeated behaviour of which the mother disapproves. It is realized by a material clause with a verbal substitute. The clause is hypothetical: it is either an imperative or a conditional dependent clause.

As an illustration, a fragment of Halliday's semantic network of control is given below, extended by sample realization statements. (The symbol :: means

preselection at the lexicogrammatical stratum.)

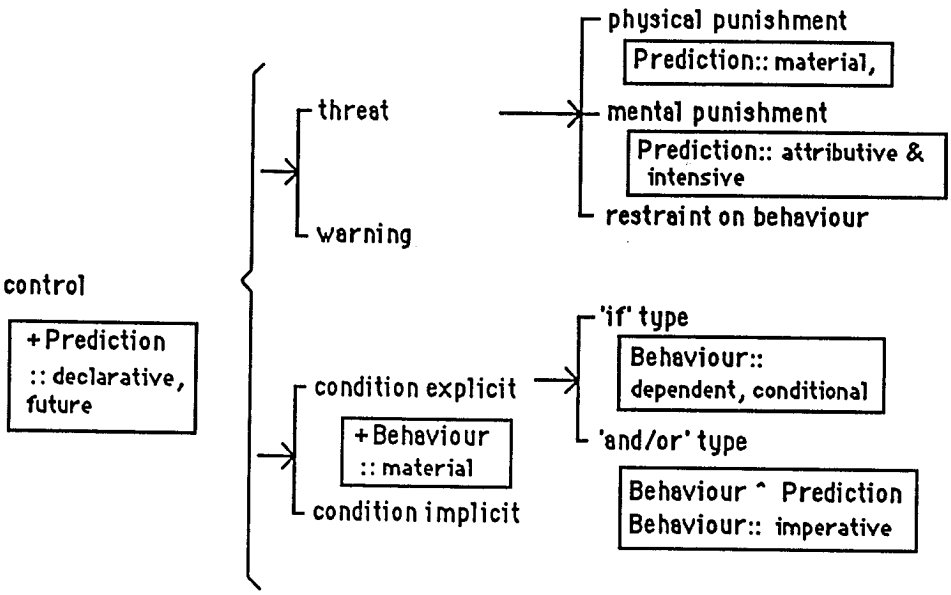


Fig. III:6-14: Semantic network generating semantic structure

This network generates semantic structures such as the following:

Prediction::	**Behaviour::**
declarative, future, material	material, dependent, conditional
`I'll smack you`	`if you do that again`
Prediction::	**Behaviour::**
declarative, future, attributive, intensive	material, dependent, conditional

I shall be cross with you	if you do that again
Behaviour::	**Prediction::**
material, imperative	material, declarative, future
You do that again	and I'll smack you

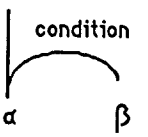
What we have, then, is a sketch of how the semantic system network might be extended with realization statements that manipulate semantic functions such as Prediction and Behaviour. Although the examples are texts not extending beyond clause complexes, this restriction is a feature of the generation task; it is no longer a restriction due to the semantic framework, as it would be in the case of a grammar-based semantics such as the chooser framework.

The sketch leaves several questions open as to the nature of the semantic structure. I will only note one set here. I stated the realizations of the elements of semantic structure, Prediction and Behaviour, in terms of grammatical features, but are the elements of semantic structure really to be specified directly in terms of grammatical features? In a small example such as the regulatory semantics they can and must be: the semantics does not have a rank scale so the elements of structure cannot be preselected for semantic features at a lower rank. However, in more complex cases, there will almost certainly be register-specific rank scales such as the lesson - transaction - move - act rank scale posited by Sinclair & Coulthard (1975) for classroom discourse.

Hasan (1984) discusses the realizations of elements of the generic structures of nursery tales and shows that they have to be stated in semantic terms rather than grammatical ones. One way of interpreting this finding is to say that these elements are elements of semantic structure at the highest rank and that they are realized semantically at the next-lower rank on a rank-scale of nursery tales.

(ii) Rhetorical structure as semantic structure. We can also adopt rhetorical structure from RST as a text semantic structure. As the name suggests, RST is currently a theory of structure and it does not have a paradigmatic component. Consequently, semantic system networks can fill a gap in RST just as RST can contribute a notion of semantic structure to a paradigmatically based semantics.

Rhetorical structure is univariate rather than multivariate and it is defined in terms of rhetorical relations such as elaboration, purpose, and condition. We can interpret the regulatory texts with an explicit condition as being organized by the rhetorical relation of condition. The condition is the satellite and the conditioned element is the nucleus:



(Here I have borrowed from systemic notation to represent the nucleus as α and the satellite as β.) We can then let these elements be specified by realization statements associated with the regulatory network:

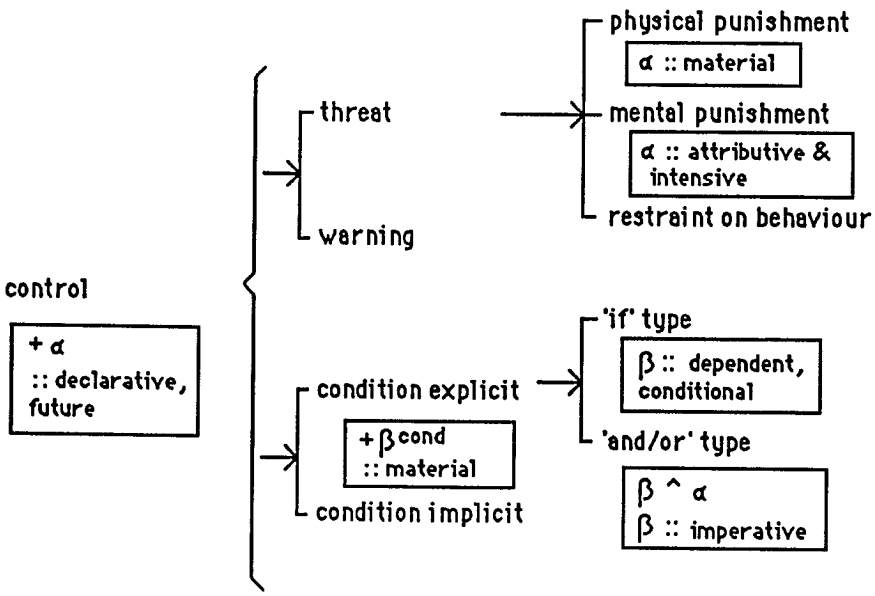


Fig. III:6-15: Regulative semantics and semantic structure

The two approaches to text organization would serve different kinds of text semantics. Generic structures (McKeown's Rhetorical Schemas) are register-specific and they would serve in an extension of register-specific kind of semantics explored in this section. Rhetorical Structure Theory, on the other hand, operates with highly generalized rhetorical relations such as elaboration, purpose, and circumstance, and would be part of a similarly generalized notion of text semantics. I am not suggesting that these are mutually exclusive approaches to text semantics and text organization. Rather, it can be shown that they serve to capture different aspects. However, I will stop at this point and not pursue the question of how to reconcile the two approaches (for some discussion, see Mann & Matthiessen, 1988). This stopping point is consistent with the grammar-based exploration of this thesis.

6.8 Semantics for identifying contextual variables

Before leaving contextual semantics, I will mention the possibility of constructing a semantics that does not take the current context of situation as the 'selector' of the situation-specific semantic but rather identifies the relevant aspects of the context of situation within a single semantic network.

As an example, let's consider the task of addressing a person and the system of address as it has been described by Ervin-Tripp (1969/74). She gives the following flow chart representation (cf. Section II:1.2.1.1) of the system of address of a "competent adult member of a western American academic community."[14]

[14] Ervin-Tripp calls the flow chart an example of socio-linguistic rules of alternation, but these are rules, of course, of paradigmatic statements. It is quite easy to restate the system of address as either a semantic system network or an inquiry network. This restatement suggests certain changes, since the repeated occurrence of the 'name known' selector is not necessary in a system network or an inquiry network.

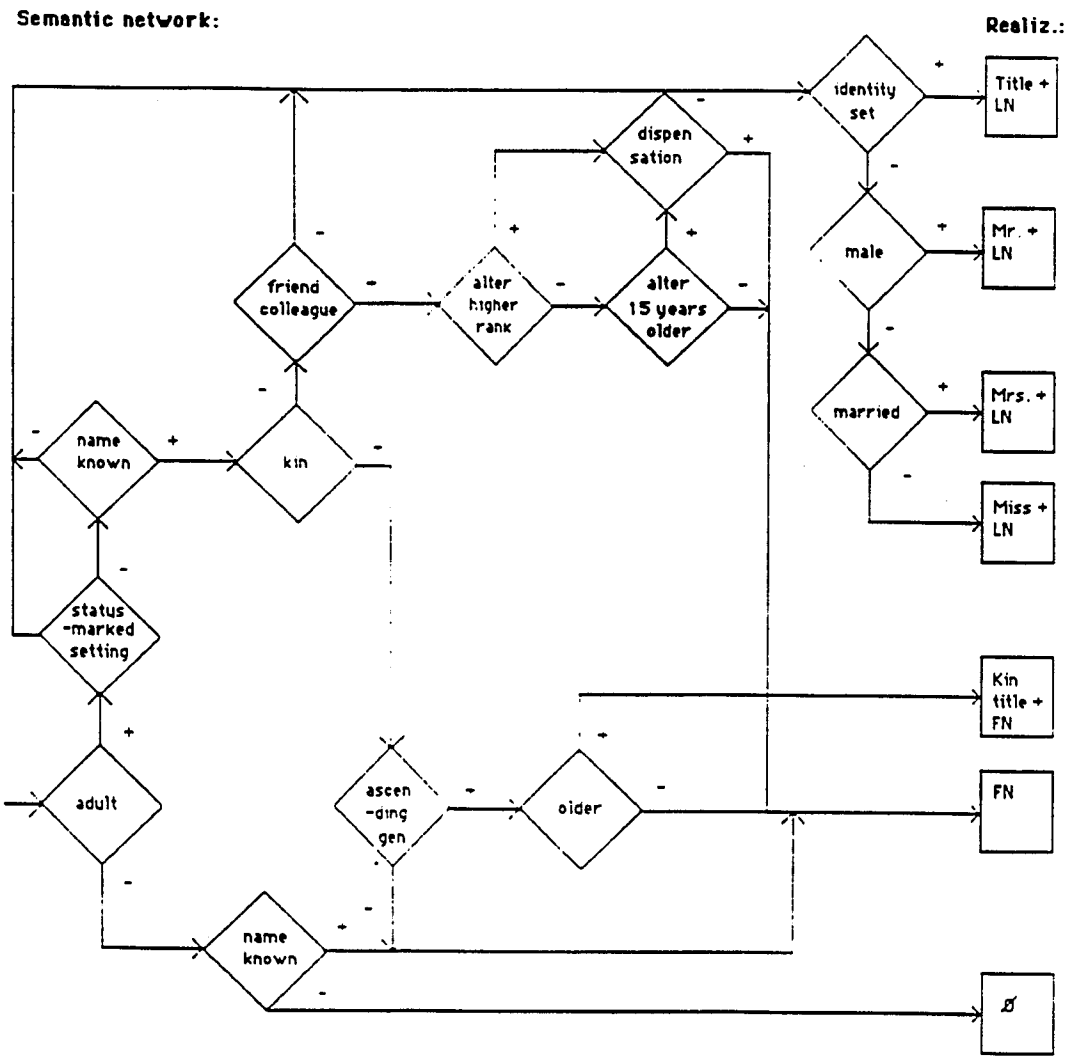


Fig. III:6-16: An American address system (Ervin-Tripp)

Ervin-Tripp (1969/74: 270-2) describes the address system as follows.

> The diamonds indicate selectors. They are points where the social categories allow different paths. ... The first selector checks to see whether the addressee is a child or not. In face-to-face address, if the addressee is a child, all of the other distinctions can be ignored. ... Status-marked situations are settings such as the courtroom, the large faculty meeting, or Congress ... Among nonkin, the dominant selector of first-naming is whether alter is classified as having the status of a colleague or social acquaintance. ... Rank here refers to a hierarchy within a working group, or to ranked statuses like teacher-pupil. ... A senior alter has the option of dispensing the speaker from offering [title plus last name] by suggesting that he use a first name or by tacitly accepting first name. ... The identity set refers to a list of occupational titles or courtesy titles accorded people in certain statuses. Examples are Judge, Doctor, and Professor.

We can interpret the address system in terms of systemic theory: it constitutes a contextual *semantics* for exploring contextual categories; more specifically, it is set up to explore the *tenor* of the relationship between speaker and listener, including the listener's status in relation to the speaker, and to address the listener according to the nature of this relationship.

The semantics of address is set up to explore and identify the tenor of the relationship between speaker and listener. In contrast, in the socio-semantic example of mother-child control, the tenor of the relationship is taken as part of the definition of the situation for which the regulative semantics is set up; if the tenor had been different, say interaction between peers, the semantics would have been different.

7. Inquiry semantics and other approaches

After the overview of the current version of the chooser & inquiry interface and the discussion of possible extensions towards a network of inquiries, I will now relate inquiry semantics to other approaches to semantics. I will start with other approaches within work on text generation to the task of interfacing the grammar. I will then turn to a more general consideration of where inquiry semantics fits among linguistic approaches to semantics.

7.1 Interfaces in text generation

In work on text-generation, there have been at least three approaches to the interface between the generation grammar of a text generator and the rest of the system:

(i) augmentations of grammatical rules by means of conditions;
(ii) pairings of semantic / conceptual frames with lexicogrammatical ones; and
(iii) an independently organized semantic interface preselecting in the grammar.

I will look at the first two in this section. The third one was discussed above in Section III:6; it is the systemic approach explored by Halliday (1973) and taken up in text generation by Patten (1986).

7.1.1 Augmentations of grammatical rules by means of conditions

There have been a number of proposals for augmenting a grammar with conditions for the purposes of generation. These conditions are comparable to the choice conditions used in Nigel. A condition specifies a conceptual/semantic value or pattern. If it applies, a grammatical action is taken: a rule is applied, a feature is chosen, or an arc is selected. Examples of this approach include:

(i) Augmented Transition Network (ATN) Grammars for generation (Simmons & Slocum, 1972; Shapiro, 1979);
(ii) Augmented Phrase Structure Grammar (APSG; Heidorn, 1972, 1975, 1977; Sowa, 1983a,b);
(iii) Alternatives in a Functional Unification Grammar are given annotations, e.g. in Appelt's (1983) TELEGRAM; Appelt observes "the system 'choosers' of NIGEL play a role similar to" these annotations.

I will discuss the first two here.

(i) Simmons & Slocum's conditions in an ATN

In generation with an ATN, the input to the grammar is a semantic net and the nodes (concepts) of this net are scanned as the grammar is traversed.[15] The arcs in the transition network correspond to constructs that can be recognized in

[15] ATNs have usually been used for parsing rather than for generation. In parsing, the input is a string of words instead of a semantic net and this string is scanned as the grammar is traversed.

the semantic net, for example role relations such as agent and object. So the condition for choosing an arc is the presence of the corresponding construct in the semantic net. Each arc may have a procedure or set of procedures associated with it for building grammatical structure.

For example, if the value of 'aspect' in the semantic net is 'perfect', a procedure associated with the arc 'aspect' in the transition network will specify have + en in the structure being built.

(ii) Sowa's proposal for Augmented Phrase Structure Grammar

Sowa (1983a, b) presents a simple method for traversing a conceptual net, mapping it into English wording with an APSG (adapted from Heidorn's work and his NLP system). The conceptual net is a fragment that has been selected for expression at some earlier stage.[16] The method Sowa describes is essentially a syntagmatic interface; conceptual/semantic structure is mapped into grammatical structure.

The process of **traversing the net** starts with one conceptual node in it and then moves one node at a time until the whole net has been traversed: "start at the conceptual relation linking the subject to the main predicate, traverse every arc of every conceptual relation, and utter the word corresponding to a concept at one of the visits to its node" (1983b: 32). Sowa suggests that this is "a universal algorithm for generating sentences from conceptual graphs" and

[16] Sowa identifies three stages in speaking: (1) determining what to say, the "selection of some [conceptual] graph or collection of graphs to be expressed", (2) deciding on how to relate this information to the listener, e.g. choosing a starting point for the traversal of the conceptual graph, and (3) determining how to express the information in the conceptual graph in words. The method summarized here is the third stage.

specifies six general rules for reexpressing the conceptual graph into wordings. The grammar of a particular language constrains the traversal process further and specifies grammatical markers: It "determines which arc to select first when more than one arc attached to the current node remains to be traversed. It must also specify additional markers such as word inflections and function words" (op cit., p. 34).

As already mentioned, Sowa uses the APSG formalism for the grammar. Rules in APSGs are of the same format as the so-called production rules used in AI. There is a condition part and an action part in APSG rules and in production rules in general. If the condition is satisfied, the phrase structure rule is applied and the action is taken. APSG **conditions** test various aspects of the conceptual net being traversed, e.g. whether or not a concept is plural, countable, etc. **Actions** associate new conceptual nodes with symbols to the right in a phrase structure rule, check off conceptual nodes that have been traversed, and specify which node to move to next in the traversal of the conceptual net.

The conceptual net encodes ideational or field information. It is easy to see how it can support ideational regions of grammar such as transitivity, but interpersonal (mood, attitude, modality, etc.) and textual regions (theme, voice, reference and determination, etc.) would seem to be more problematic. One can imagine how theme selection could be controlled by manipulating the order of traversing the conceptual net. For example, if the net contains a specification of location, this location is thematic when it is traversed first. Similarly, different voice selections can be achieved by visiting different nodes for operative and

receptive for the expression of the Subject (cf. Sowa (1983b: 37). However, the information that determines where to start the traversal would have to be supplied from some source other than the conceptual net, since it is not encoded in the net.

Using the APSG framework, Heidorn (1977) describes an algorithm for "generating noun phrases to identify nodes in a semantic network".

7.1.2 Jacobs' parallel hierarchies in PHRED

In the PHRED generator (Jacobs, 1985), the interface between grammar and the stratum above grammar is handled by pairings of a "concept" and a "pattern" of grammatical structure in the static model (what he calls the knowledge base):

> The use of the PC [pattern-concept] pair as a unit of linguistic knowledge distinguishes PHRED from some other language production mechanisms (McDonald, 1980; Mann and Matthiessen, 1983; McKeown, 1982) in which grammatical information and conceptual information are separated.

The idea that grammatical patterns and conceptual or semantic patterns are organized in an independent but correlated way is, of course, very similar in general outline to the parallel interlocking hierarchies of Tagmemic theory and the stratal organization of Stratificational theory. Jacobs' PC pair is not unlike the kind of pairing we find in a four-cell tagmeme in tagmemic theory (e.g. Pike, 19). The general idea is also similar to Hudson's (e.g. 1984) Word Grammar.[17]

[17] One of the interesting features of the PHRED generator is that it can handle "idiomatic and specialized" use of language. The use of the VIEW relation to handle certain grammatical metaphors in PHRED's successor KING was touched on in Section II:3.3.2.

During generation, the generation process uses the pairings of patterns and concepts.

In principle, the inquiry framework is equally well suited to all three metafunctions. The responses can come from field, tenor, or mode; or from the rhetorical structure of the text.In a similar way, Fawcett's (1980) problem solver can consult knowledge of the universe, as well as a model of the addressee, and affective states. In this respect, the Nigel interface is similar to the one discussed in McDonald & Pustejovsky (1985) but it differs from the approach taken in Jacobs' (1985) generator. In his approach, the 'conceptual' and 'linguistic' hierarchies are integrated and run in parallel, but the hierarchies are essentially experiential.

7.2 Approaches to semantics in linguistics

At the beginning of this chapter, I suggested that the answer to the question of what kind of semantics we need for text generation is that we need an interface or interlevel. How does this conception of semantics relate to approaches to semantics within linguistics? If we distinguish two broad traditions, formal and functional semantics, it falls within the latter.

7.2.1 Semantic traditions: formal & functional

In his appendix to Ogden & Richard's Meaning of Meaning, Malinowski (1923) argued against logical and philosophical approach to meaning and in favour of a functional one:

> What I have tried to make clear by analysis of a primitive linguistic text is that language is essentially rooted in the reality of the culture, the tribal life and customs of a people, and that it cannot be explained without constant reference to these broader contexts of verbal utterance. ... This attitude in which the word is regarded as a real entity, containing its meaning as a Soul-box contains the spiritual part of a person or thing, is shown to be derived from the primitive magical uses of language and to reach right into the most important and influential systems of metaphysics. Meaning, the real 'essence' of a word, achieves thus Real Existence in Plato's realm of Ideas; and it becomes the Universal, actually existing, of mediaeval Realists. The misuse of words, based always on a false analysis of their Semantic function, leads to all the ontological morass in philosophy, where truth is found by spinning out meaning from the word, its assumed receptacle. ... In our Theory of Meaning, we have seen that Language serves for definite purposes, that it functions as an instrument used for and adapted to a definite aim. This adaptation, this correlation between language and the uses to which it is put, has left its traces in linguistic structure. But of course it is clear that we must not look in the domain of logical thinking and philosophical speculation for light on the aim and purposes of early speech, and so this purely logical view of language is as useless as the purely grammatical one.

Malinowski's statements illustrate a contrast between two traditions in semantics. One tends towards philosophy and logic; the other towards ethnography and rhetoric. The two traditions in semantics can be opposed according to the discipline which they are oriented towards: philosophical vs. ethnographic, logical vs. rhetorical.[18] They can also be opposed as formal vs. functional.

[18] These differences reflect the differences in the approach to language in general that can be seen throughout the history of the study of language; see Halliday (1977).

7.2.2 Formal semantics in general

Formal semantics is concerned with questions that have arisen in philosophy and logic; for example:

what is the nature of meaning -- object, concept, image, etc.?

what is valid inference; how can semantic representations be used to compute entailments?

how can semantic well-formedness (meaningfulness) vs. semantic anomaly (meaninglessness) be represented?

Because of its concerns, formal semantics tends to equate meaning with ideational meaning and semantics with the study of ideational meaning: ideational meaning relates to the interest in meaning and reality, inference, and so on. Interpersonal and textual meanings fall largely outside the scope of semantics and are in the domain of pragmatics, stylistics, or some extra-semantic component.[19] Since the focus is on ideational meaning, logic can be drawn on as a source of formal representation; it provides support for inference, for example.

In my discussion of the semantic interface, I have not focused on the questions of formal semantics nor have I made any particular use of the results of formal semantics.[20] This is not to deny the importance of the research topics of

[19] One exception is part of DETERMINATION. It is brought into the scope of philosophical semantics as quantification, although it is textual rather than experiential. I will touch on this issue in Chapter IV.

formal semantics. But, for present purposes, I think they have to be located in relation to the overall task of text generation. For example, rather than assuming that entailment is one of the central tasks of semantics, I think we have to take a step back to see where entailment falls within the overall account of text generation. It may be that entailment will belong most centrally to the process of selecting and filtering the information to be presented (cf. Section I:1.1) and if that is the case, entailment will just be one of several factors determining what is obvious to readers in a certain context of situation. Further, what is entailed may not be obvious.

7.2.3 Truth conditions and model theoretic semantics

As we have seen (Section III:1.3), inquiry responses can be thought of as choice conditions. The notion of choice condition suggests that there may be a connection with formal semantic theories using the notion of truth condition. Both are conditions on the context of the grammar. Inquiries are answered by an examination of Nigel's environment. Truth conditions are evaluated with respect to a model that corresponds roughly to the knowledge base component of Nigel's environment. A truth condition can be translated into a choice condition. As an illustration, consider Dowty's (1979) characterization of the so-called progressive in English. The progressive of an event, he says,

> is true at < l,w > iff for some interval l' such that l includes l' and l is not a final subinterval for l', and for all w' such that w' MEMBER-OF Inr(< l,w >), the event is true at <l',w'>. (p. 149)

[20] The knowledge representation technique I will use in an informal way in Chapter IV is not that of formal logic.

(I = interval, w = world, and Inr (<I,w>) = the inertia worlds at <I,w>.) This can be restated more informally as follows:

> The progressive of an event is true for an interval l of a world w if and only if for another interval l' in which l is included but not final (i.e. if l' is a temporal frame for l), the event is true in w' at l'.

This truth condition can be used as a choice condition. Assuming the identities of I and I' have been established in their worlds and I' has been established as an interval during which the event is true, we can state the choice condition as follows:

> **If** the interval I' includes the interval I as a non-final subinterval (i.e. if I' is a temporal frame for I), **then** choose progressive.

A choice condition cannot always be translated into a truth condition. The notion of truth condition is narrower than the notion of choice condition. Since it is the condition under which something is true, there is a bias towards factors that affect truth and towards the speech function where truth has been claimed to be at issue, i.e. statements. In other words, truth conditions are typically associated with an ideational semantics for statements. However, the reasons for choosing features in the grammar are more diverse and choice conditions are not restricted to truth values. Broadly speaking, choice conditions may be interpersonal and textual as well as ideational. If we want to use work based on truth conditional semantics, it is useful to think of truth conditions as translatable into one kind of choice condition.

As suggested above, the notion of choice condition is similar to Robin Fawcett's (1980: 253; 1983) procedural felicity conditions. Fawcett notes the relationship between his procedural felicity conditions and truth conditions and emphasizes the procedural nature of the conditions; he (1980: 253) writes that linguists

> are discovering that the specification of meanings built into the code of language requires to be stated in complex terms of felicity conditions, truth conditions (which are really just a sub-category of felicity conditions), etc.; and moreover that these approaches to meaning can always be interpreted as PROCEDURAL SEMANTICS that relates features of language to knowledge of the universe.

7.2.4 Functional semantics in general

The notion of functional grammar (or syntax) has long been recognized in linguistics and linguists orient towards it in their work: functional theories of grammar are proposed and functional descriptions are offered. The same cannot be said of functional semantics. Although there is a good deal of work on various areas that we may bring together under the heading and framework of functional semantics, this work is not explicitly recognized as or *called* functional semantics; it tends to remain distributed both in terms of topic and in terms of disciplines. For instance, cognitive linguists and computational linguists have worked on experiential meaning, anthropological linguists have worked on experiential meaning from another perspective (the lexical approach, through folk taxonomies), some sociolinguists have explored interpersonal systems of meaning (e.g., systems of address), and Prague School linguists have studied textual meaning.

The notion of functional semantics thus has more of a flavour of an interpretation of work concerned with meaning than of an established level of interpretation; it does not usually serve as an approach to the study of meaning that linguists orient towards. There are various reasons for this. One has to do with the fact that quite a narrow conception of semantics if often accepted -- roughly experiential semantics, often with a further narrowing to lexical experiential semantics. As a result, other areas -- interpersonal and textual semantics -- are pushed out of semantics and into pragmatics and discourse analysis. But in spite of these divisions it is important to recognize the unity in the study of meaning, which is what the notion of functional semantics is intended for. It represents a natural move in a functional exploration of language: a functional grammar that spans the full metafunctional spectrum (ideational, interpersonal, and textual) needs a functional semantics that also spans the full metafunctional spectrum.

Functional semantics operates with a set of questions different from those entertained within formal semantics; questions that have to be addressed within a functional semantic framework include:

How does semantics serve as the entry level to the linguistic system and how does it relate to higher-level semiotic systems?

What are the semantic resources available to the speaker -- for example, what are the strategies for persuading; what are the resources for addressing an interlocutor?

How is our experience interpreted semantically, for instance, how is the field

of kinship (illness, plants, etc.) organized?

Semantics as an interlevel belongs with functional semantics rather than formal semantics. We have already seen examples of how inquiry semantics addresses or can address the topics of functional semantics. It serves as an interface between the Nigel grammar and its environment. It has functional diversity; it covers interpersonal and textual meaning as well as ideational meaning. It can be used to represent the semantic strategies available in e.g. regulatory contexts. And it can also be used to represent the semantic aspect of the taxonomic organization of lexical fields of experience.

7.2.5 Semantic features (components)

Functional semantic studies of lexical fields such as kinship have been aided by the technique of componential analysis and I will just note briefly how it relates to inquiry semantics.

One of the inquiries exemplified above was PrecedeQ. It has two responses, PRECEDE and NOT-PRECEDE. There has, of course, been a long tradition of using labels like PRECEDE and NOT-PRECEDE to represent semantic primitives as semantic features or components. MALE, FEMALE, ADULT, HUMAN, NON-HUMAN, ANIMATE, SOLID, and CANINE are all examples of such semantic features. They have been used both in componential analysis and in systemic analyses of semantics; the two are the same in the sense that they are techniques using features, as Leech (1969: 20) notes:

> Systemic analysis in semantics is perhaps better introduced under the title componential analysis by which it has been know in fruitful applications in the study of kinship systems, colour terminology, and other fairly restricted domains of meaning. Componential analysis is founded on the notion of semantic contrast: expressions are assumed to contrast simultaneously on different dimensions of meaning, or (to use the present terminological preference) within different semantic systems.

The dimensions of contrast (systems) can be interpreted in the inquiry framework as inquiries and the semantic features (components) as responses to inquiries or the application / non-application of choice conditions. For example, the opposition between MALE and FEMALE corresponds to an inquiry about sex, whose responses are MALE and FEMALE. In this view, MALE, just like PRECEDE, presupposes an explicitly stated condition that characterizes the property of being male in such a way that the environment can be tested for its application.[21] To summarize:

inquiry semantics	systemic semantics	componential analysis
inquiry	system	opposition
response	feature	component

Fig. III:8-1: Inquiry semantics, systemic semantics, and componential analysis

If a binary opposition is identified in componential analysis, the two semantic components (features) correspond to the two responses to a yes/no question. If a multivalued opposition has been identified, the components correspond to the

[21] In a similar way, phonological features like +rounded, -back, +sonorant, and -voice can be given phonetic interpretations outside the linguistic system.

responsive to an alternative question with more than two alternative answers.

The lexical item *man* is often described as MALE, ADULT, and HUMAN in componential frameworks. This suggests that three conditions have to be met in order for it to be chosen, i.e. three inquiries have to be given positive responses by the environment: is it male?; is it adult?; and is it human?

The technique of componential analysis has been used primarily in the area of lexical semantics, for such lexical fields as kinship.[22] In contrast, the chooser and inquiry framework has been used primarily as a framework for grammatical semantics. There is an interesting complementarity here and there is every reason to try to extend inquiry semantics to the lexis part of lexicogrammar (cf. Section II:4 above).

8. Conclusion

In this chapter, I have moved above the lexicogrammatical level of a text-generator, to the semantic level. I started out with a presentation of the particular kind of approach to a choice semantics developed for the Nigel grammar -- the chooser and inquiry framework. Perhaps its most central property is that it is grammar-based; semantics is organized in terms of the systems of the grammatical system network. This has both a practical value and a heuristic one. From a practical point of view, it is easier to restate the grammar in semantic terms if one follows the organization of the grammar quite closely. This has been true of interpretive semantics for the past two thousand years or so;

[22] Although most work using lexical features has probably been lexical, Leech (1969) uses semantic features to deal with a number of areas of grammatical semantics.

however, chooser and inquiry semantics is based on systems (at all ranks) rather than structures or inflectional categories such as case and number at word rank and it covers the whole functional spectrum rather than only experiential meaning. From a heuristic point of view, the chooser and inquiry approach allows us to see very clearly where we need to operate with semantic networks that are more independent of the grammatical system network than the individual choosers associated with systems are.

After the presentation of the chooser and inquiry framework, I identified areas where the chooser organization runs into problems and explored the possibility of a more independent network of inquiries. The problematic areas are interesting from a theoretical point of view; they highlight the metafunctional organization and the effect that grammatical metaphor has.

Finally, I turned to the question of how the chooser and inquiry framework relates to other approaches to semantics, both systemic and non-systemic ones.

I will now move up one more level and consider the environment in which the grammar and its semantics operate.

CHAPTER IV: THE ENVIRONMENT OF LEXICOGRAMMAR

1. The organization of the environment

The source of responses to the inquiries presented by the chooser and inquiry interface has been identified as the **Environment**. If we just focus on the Nigel component, we can treat the environment as a black box. It does not matter how the responses to the inquiries are arrived at, as long as they are appropriate. This independence makes the Nigel component portable, which is very desirable.

1.1 The components of the environment in current systems

When we focus on the overall design of a text generation system such as Penman, the design of the environment becomes a central question and I will approach it from the point of view of the lexicogrammar here. By way of background, however, let me return first to the simple design of a text generator presented in Section I:1.1. According to that design, the environment contains the following sources of information that can be drawn on to respond to inquiries:

(i) the knowledge base;

(ii) the reader model;

(iii) the rhetorical resources and text plans.

These sources respond to or can be assumed to respond to different kinds of inquiries from Nigel. One way of differentiating the inquiries is by metafunction; e.g., experiential inquiries get their answers from the knowledge base, while textual inquiries appeal to the reader model and the rhetorical resources. However, neither the reader model nor the text planning component have been worked out in a general and detailed way in any generation system and it will be helpful to develop a number of design considerations that have to be accommodated in the design of the environment of a text generator. To contribute to this development, I will approach the organization of the environment from the linguistic system. This approach suggests a particular way of organizing the environment in the most general terms. I have already touched on this metafunctional view of the design of and division of labour in the the environment (Section III:1.6) and I will return to it presently in Section IV:1.3, since I think it provides a good foundation for thinking about the environment from the lexicogrammatical vantage point.

1.2 Approaching the environment from lexicogrammar

We can take the *grammatical resources* of a particular language as source of suggestions for how to organize information in the environment. For instance, when we use the Nigel generator, each inquiry can be the basis of a detailed design decision. This design will be considerably more highly differentiated

than some general, all-encompassing notion such as 'text-plan'.

Another consideration is the dynamics of selecting the information to be presented in a text. Here we need to look at the way in which the grammatical resources are used in texts of various types to present information in units of information, in clauses, and so on. I will focus on the more static aspect of the organization of information rather than the selection of information to be presented.

The suggestions for organizing information in the environment I will present are based on a linguistic approach to modelling, which reflects considerations of how information is organized and classified when it is represented lexicogrammatically in text generation. In other words, I am concerned with the organization of information for the purpose of verbalizing it. As far as the knowledge base is concerned, it is important to emphasize that this is only one of its possible uses; it might also be used in reasoning, in planning, and perhaps in the interpretation of sensory input.[1] But, at the same time, the use of language is not restricted to generation or understanding; perception, reasoning, and planning can also be linguistic activities. When we turn to other components of the environment (what I will call the interaction base and the text base), there is less 'competition' with language-based designs: to the extent that these other components are modelled at all in a text generator, the modelling is usually driven by the need to generate text rather than any other

[1] For instance, in a current application of Penman, the same knowledge base is used to support presentation of navy information by means of verbalization and by means of tables and maps controlled by menus. The control of the presentation of information by means of menus favours the object-centred representations, leading to the equivalents of grammatical metaphors, where events and activities are represented as if they were attributes of objects -- verbally: *ship A is on exercises; ship A has a rendez-vous with ship B;* and so on. At the same time, it has to be possible to produce wordings such as *ship A will rendez-vous with ship B* and the knowledge base has to be able to support these varying demands.

considerations.

I have said that I am concerned with the organization of information in the knowledge base for the purpose of verbalization. One central question is what the nature of this information is from a stratal point of view. If we take the knowledge base as a given, the information is knowledge or, as it has sometimes been called, propositional knowledge or even semantic knowledge. But what is knowledge? If we approach the 'knowledge' base from language, as we are doing here in designing it, the information it contains is ***meaning.*** There has been a considerable degree of uncertainty in this area, as the variation between the terms "conceptual net" (graph) and "semantic net" used for the net representing the information indicates.[2] The question of whether the information in the 'knowledge' base is knowledge or meaning might be thought to be mainly a terminological one. However, there are other consequences as well.

(i) If the information is meaning, there is no stratal difference the 'knowledge' base and the (ideational) semantics of the text generator; i.e., there is no difference in abstraction and both deal with the same kind of information. If, on the other hand, the information is knowledge, we should expect there to be a stratal difference.

(ii) If the information is meaning, it follows that the main guide to its organization is language itself. If, on the other hand, the information is knowledge, we should identify other principles for organizing it.

[2] Arguably, natural taxonomies have been based on the categories of language in any case, from the early days of Aristotle's typology of categories, used e.g. in later pre-modern logic and in Wilkins' (1668) Essay.

In the remainder of the chapter, I will assume that the information is meaning. In any case, it may turn out to be quite reasonable to interpret knowledge in general as meaning, articulated and differentiated by different semiotic systems.

It is quite common to reflect English ***lexical semantic*** organization in the conceptual organization of the knowledge base when the domain model for a particular generation task is built (this is reflected in the notion of a *terminological* component or TBox; cf. also Quillian's (1967) early conception of the semantic net based on the dictionary). The domain model is often a *lexico*-semantic net, a kind of domain-specific thesaurus.[3] The approach can be generalized; we can take the grammar part of lexicogrammar as well as the lexis part into consideration when we build a knowledge base, so that it reflects not only lexical semantics but also ***grammatical semantics.*** This is what we have done for the Penman generator. We have created a general taxonomy under which various domain models can be classified.[4] This general taxonomy is often referred to as the upper structure of the knowledge base. It draws heavily on an ideational grammatical semantic typology developed by Halliday and me and based on Halliday's interpretation of English. This typology has come to be known as the Bloomington lattice. I will discuss a small part of it in my exploration of the organization of the 'knowledge base' in Section IV:2.

To be more precise, I should say that the knowledge base will reflect one kind of lexicogrammatical semantics: ideational lexicogrammatical semantics, the

[3] An account of a knowledge domain will contain two components: the general domain model just mentioned and instantial facts (asserted) about the domain -- cf. the distinction between TBox and ABox in Section IV:2.1.

[4] Three domains have been classified under it to date: an electronic mail and calendar domain, a navy domain, and a programming domain.

kind of semantics that deals with ideation. There are two other kinds, interpersonal and textual. They are usually not part of the knowledge base, but I will return to the full functional spectrum of semantics below. In the meantime, I will make a few observations about the linguistic approach in relation to the knowledge base.[5]

Although I wili be using lexicogrammar in my exploration, my discussion is not about lexicogrammar. It is about the organization that is above lexicogrammar and is projected on to it in generation. One reason for using lexicogrammar to infer the organization of the knowledge base and other components of the environment is that the lexicogrammar of a natural language reflects a theory of that organization. Lexicogrammar reflects a theory or model of reality (to focus on the ideational metafunction) and this theory is the ideational semantic organization of the system.[6] Or, to put it in non-linguistic terms, it is the conceptual organization we find in the knowledge base of a generation system.

Another reason for using lexicogrammar is a practical one: we know a good deal more about lexicogrammar than we know about the organization of other parts. In particular, we have extensive functional accounts of grammar such as those by Halliday, other systemic functional linguists, and other functional linguists that interpret lexicogrammar as a resource in a communicating system. Systemic linguistics simplifies the move of making use of lexicogrammar in our modelling, because

[5] The strategy of considering what the lexico-grammatical demands for support are is somewhat analogous to what happens when we take our demands to an expert who provides services. If I wanted to build a house, I would take my wishlist to a builder, but since I'm not an expert at all myself, it is very likely that he or she would take the lead and make demands on me for information -- information I would never have thought to supply since my view of the house would be as a place to live, not as a thing to build.

[6] It also reflects a theory of (symbolic) interaction -- the interpersonal metafunction -- and a theory of the nature of information presented in text -- the textual metafunction: see Section IV:1.3.

• the grammar is a functional one; it is 'semanticky' and thus serves to bring out semantic distinctions we need to make. For example, transitivity is interpreted in such a way as to bring out a typology of process concepts as well as a typology of phenomena that can participate in these processes.

• the grammar combines a 'case frame' approach of the kind that has been built into semantic nets with a taxonomic organization (systemic) of these 'case frames' that can be related to the hyponymic taxonomy of a semantic net.

• lexicogrammar is organized in such a way that grammar is related to lexis by delicacy and this corresponds to the move from specific to general that is needed in the knowledge base taxonomy. For example, it is possible to classify lexical concepts such as mixing, beating, adding, and frying (via intermediate steps) under the grammatical concept material process.

The strategy I'm using rests on two inter-related assumptions about lexicogrammar and theories of reality. (i) Lexicogrammar is not arbitrary in relation to semantics. Rather, it is related to semantics in a natural way and it is organized according to functional principles. Under this assumption, it makes sense to use lexicogrammar as a way of exploring the higher organization: if lexicogrammar were an arbitrary rule system, we would not be able to make any use of it to explore higher organization and my strategy would make little sense.

(ii) We do not have direct access to reality, but only indirect access through interpretations of it. Ideational semantics is one interpretation of reality; it is the

one that is reflected linguistically. There is no a priori conflict between linguistic facts and facts pertaining to reality, but there may be conflicts between the semantic interpretation of reality and other interpretations of reality. For example, according to the system of English semantics, there are conscious beings who engage in private mental processing. An extreme behaviourist might disagree with English and avoid such interpretations; but this would be a conflict between two interpretations of reality, not between linguistic facts (English) and facts of reality (the behaviourist position). Furthermore, what are taken to be conflicts between 'language' and the 'real world' are in fact often conflicts between two alternative perspectives, both of which are embodied in language. One is a congruent interpretation and the other or others are metaphorical ones.[7]

There is an important corollary to this second assumption. When we come across grammatical statements we may have to re-examine them in functional semantic terms to see that the grammar actually embodies an interpretation of reality. For example, if a grammar says that verbs of perception take either nominal or sentential complements, this may seem to be only a linguistic observation. In fact, however, it reflects the grammar's 'theory' of perception, a theory of what kinds of phenomena can be perceived, viz. things as well as macrothings; and things as well as metathings (cf. Section IV: 2.3.3.3). Similarly, the distribution of *that*-clauses in English may look like a purely grammar-internal affair (as my reference to it suggests it is); however, once we explore a bit further, we discover (among other things) that English embodies an interpretation of reality according to which facts cannot operate on phenomena

[7] For this point, compare Halliday's (1987) analysis of Bohm's (1979) complaint that natural language forces us to view reality in terms of things rather than in terms of processes. Here there is a 'conflict' between the reifying metaphorical mode of the language of physics and the congruent mode of spontaneous casual conversation.

in the material world (as opposed to the world of consciousness).

1.3 The three bases

What does the overall organization of the environment look like? I will return to the perspective first mentioned in Section III:1.6. Using a systemic functional theory and the grammar of English in this way suggests three perspectives on the environment, one for each metafunction: (i) the ideation base, (ii) the interaction base, and (iii) the text base.

(i) The ideation base, which is a theory of 'reality' -- what one might call a *semanticization* of the world (as a complement to the notion of a conceptualization, since I'm taking the ideation base to be a meaning base rather than a knowledge base). This is the part of the environment that supports 'ideation' and hence the ideational component of the lexicogrammar, i.e., a particular interpretation of the world. The phenomena of the world are ranked and are organized into networks -- taxonomies of sequences, process configurations, and simple phenomena. They are interpreted as units with a functional type of structure. For instance, process configurations are configurations of a nuclear process, participants and circumstances; they are differentiated into a small number of general types -- processes of doing and happening, of sensing, of saying, and of being and having. And so on.

(ii) The interaction base, which is a theory of (symbolic) interaction and role relationships. This is the part of the environment that supports linguistic interaction or exchange and hence the interpersonal component of the grammar, i.e., the speaker's assignment of linguistic role-relationships, the

speaker's evaluations, attitudes, and so on. (In some respects, we can think of the interaction base as different interpersonal colourings superimposed on the ideation base.)

(III) The text base, which is a theory of information as text. This is the part of the environment that supports the presentation of information from the ideation base and the interaction base as text in context. The text base includes a conjunctive component for developing and organizing text in terms of conjunctive relations.

The three bases are shown in relation to the metafunctional components of the grammar (at the rank of clause) in the figure below.

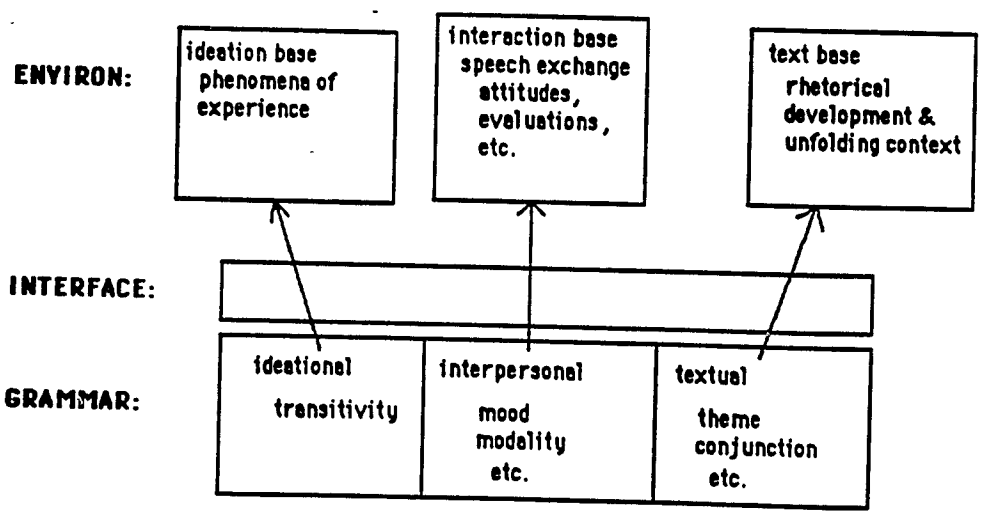


Fig. IV:1-1: The three bases of the environment as seen from grammar

The three bases, the ideation base, the interaction base, and the text base, obviously suggest the three 'components' of systemic context theory -- field, tenor, and mode. However, I maintain a terminological distinction to indicate the different starting points. Ideation base, interaction base, and text base represent a view of the environment from the lexicogrammar, whereas field, tenor, and mode are 'components' of a theory of context and thus reflect a starting point 'outside' language.

The three bases must be able to support the three metafunctions. We can think of this support as being recorded locally in plans for clause complexes, clauses, nominal groups, and so on.[8] Each local plan will contain contributions from each of the three bases. For instance, a clause plan contains the following types of information:

Base providing support	Type of information
ideation base	a configuration to be represented lexicogrammatically, consisting of a process, participants, and circumstances
interaction base	speech function of a particular type, with speaker and listener roles specified and possibly also e.g. the

[8] I do not mean to suggest that these plans are necessarily fully specified when the generator starts producing a grammatical unit; rather, the plans specify the kinds of information needed to support the grammar. Particularly in the case of clause complexes, it seems very likely that planning and grammatical realization are interleaved (cf. Section II:3.2.4).

manner	
	of its performance; possibly also assessments of and attitudes towards the proposition / proposal of the
speech	
	function
text base	possibly a conjunctive relation, relating the
configuration or	speech function to prior text;
	a specification of what is to be the local context of presentation;
	a specification of what is to be presented as
unmarked	news.

I will discuss the ideation base in Section IV:2 and the text base in Section IV:3, but I won't explore the interaction base further here. I will pay particular attention to the local plans produced by the text base.

2. The ideation base

The ideation base corresponds by and large to the knowledge base of Figure I-3 in Chapter I and I will start by briefly reviewing the notion of knowledge base in text generation systems.[9]

[9] There is also overlap between 'rhetorical resources' and the text base. For example, the text base includes a conjunctive component for organizing text in terms of conjunctive relations and the rhetorical resources includes some kind rhetorical strategies such as McKeown's (1982) Rhetorical Schemas or Mann & Thompson's (1987) Rhetorical Structure Theory.

Before I start let me make clear why I maintain a distinction between "knowledge base" and "ideation base". There are two reasons for using the term ideation base as an alternative to knowledge base.

(i) First, given systemic metafunctional theory, the term ideation base is more precise than the term knowledge base: ideational knowledge is a particular kind of knowledge, differentiated from interactional knowledge and textual knowledge. By calling the knowledge base the ideation base, we indicate what kind of knowledge it is a model of.

(ii) Second, we are not committed to the view that the information that constitutes the ideation base is knowledge; we can also look at it from the vantage point of language as meaning.

(iii) Certain aspects of what may go into a knowledge base (speech act operators, quantifiers, etc.; cf. the ABox in Section IV:2.1) are not part of the ideation base, but would come from the views taken in the interaction base and in the text base.

2.1 The notion of 'knowledge base'

The knowledge base has been the most prominent of the system resources in the environment. All systems have some knowledge source, even though they may lack a reader model and rhetorical resources. It is the best developed aspect of the environment in text generation systems: and it has also been explored widely outside text generation within computational linguistics and

artificial intelligence in terms of knowledge (conceptual) organization. Interest has focused more on the theory of 'knowledge' representation than on particular 'knowledge' descriptions.[10]

In the current implemented part of the Penman system, the knowledge base is the only implemented part of the environment that can be used in responding to inquiries. The knowledge base consists of two kinds of information, general knowledge about concepts organized into a taxonomy and instantial knowledge about particular situations and individuals. These two kinds of information correspond to the major parts of KL-TWO, the framework used, viz. NIKL and PENNI:

(i) *NIKL component:* concept frames organized into a taxonomic hierarchy of concept types; for example, the concept of forwarding a message in an electronic mail and calendar system belongs in the taxonomy of concept types.

(ii) *PENNI component:* includes a collection of propositions, whose predicates are concepts in the NIKL hierarchy; for example, the instantial information that Smith forwarded message 63 last Wednesday belongs in the collection of specific propositions.

In related work, Brachman, Fikes and Levesque (1983) identify two components of KRYPTON, the *terminological* component and the *assertional* component, and describe them as follows:

... two main components for our representation system: a

[10] Exceptions in two different traditions includes work by Schank and others of the 'Yale School' in AI on e.g. scripts and primitive acts; and work by Hobbs and others at SRI on common sense knowledge. Kathy Dahlgren's work on 'naive semantics' at IBM should also be mentioned.

> terminological one (or 'TBox') and an assertional one (or 'ABox'). The TBox allows us to establish taxonomies of structured terms and answer questions about analytical relationships among these terms; the ABox allows us to build descriptive theories of domains of interest and to answer questions about these domains.

The representation of the TBox is cast in terms of concept frames with associated roles; the frames are organized into a taxonomic hierarchy. The representation of the ABox is cast in terms of a first order predicate logic, with the difference that the predicates are drawn from the TBox. The concepts become one-place predicates and their associated roles become two-place predicates. Brachman et al. summarise the organization of KRYPTON as follows.

> ... Overall, the structure of a KRYPTON system can be visualized as in [Figure IV:2-1]: a TBox of roughly KL-ONE-ish terms organized taxonomically, an ABox of roughly first-order sentences whose predicates come from the TBox, and a symbol table maintaining the names of the TBox terms so that a user can refer to them.

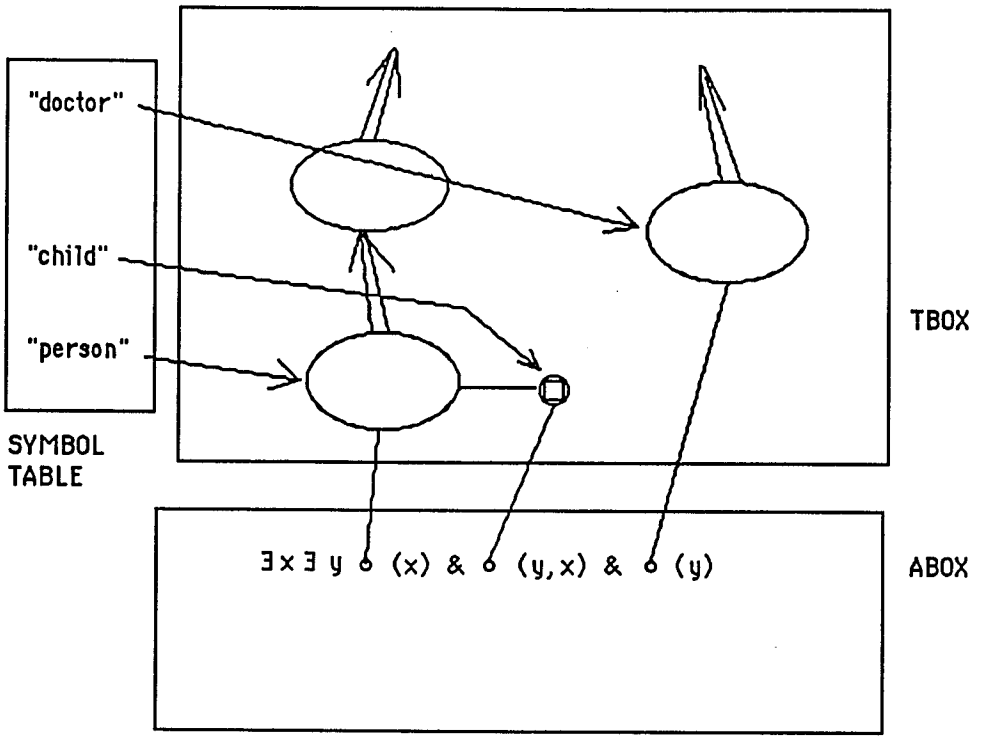


Fig. IV:2-1: KRYPTON overview (adapted from Brachman et al. 1983)

The notion of a concept frame will be explained presently. For the time being, we can think of the distinction between the TBox and the ABox as the distinction between *potential knowledge* and actual or *instantial knowledge.* Or, to put it in Hjelmslevian terms, between *system* and *text,* for the TBox contains *knowledge as system* and the ABox contains *knowledge as text.* Clearly, there is more to the ABox than instantiation of TBox concepts, since assertion and quantification are added. Both assertion and quantification are non-experiential in nature and are the concern of the interaction base and the text base rather than the ideation base. I will return briefly to the question of how they can be represented in Section IV:2.4 below.

Let's now return to Nigel. In the computation of a response to an inquiry in Nigel, either of these two kinds of components may serve as the source. For example, if an inquiry is concerned with taxonomic information, the NIKL hierarchy is the source of the response. If an inquiry is concerned with the presence of a particular type of information in a proposition, the PENNI component is the source.

NIKL component. NIKL exemplifies a common approach to knowledge representation; it belongs to the KL-ONE tradition of knowledge representation (e.g. Brachman (1978), Brachman and Schmolze (1983)) in particular and to the (frame-based) semantic nets or conceptual graphs developed in computational linguistics in general.[11] It embodies a notion concept that is a frame of roles and a conceptual taxonomy of the hyponymic kind. It is a combination of so-called semantic nets or conceptual graphs and conceptual frames.

The notion of frame is related to Fillmore's (1968) theory of case frames, which has been a source of inspiration in work on knowledge representation; at the same time, the notion of frame is a very general one that has been used for a long time in various disciplines (cf. the notion of a structured unit in Halliday, 1961).[12] One of the differences between Fillmore's case grammar and

[11] In computational linguistics, there are a variety of approaches to knowledge representation. The two major techniques can be called logic based and conceptual (semantic) net based. The two techniques may often be inter-translatable (cf. for example Scragg (1976)), but they have been used for different purposes: semantic nets are often used to represent the knowledge potential whereas predicate logic is often used to represent instantial knowledge. Here I will concentrate on conceptual (semantic) nets. For some overviews of knowledge representation, see e.g. Charniak & Wilks (1976), Barr & Feigenbaum (1981: Ch. III), Sowa (1983a), and Brachman & Levesque (1985).

[12] See e.g. the short overview presented by Tannen (1979), who, however, does not mention any of the work in the Malinowksi - Firth - Halliday tradition.

Halliday's (1967/8) transitivity grammar is that Halliday's theory includes the paradigmatic notion of a system network as well as the syntagmatic notion of a configuration of transitivity functions. That is, in his theory, 'case frames' are paradigmatically organized in the system network of transitivity. In this respect, frame-based nets are closer to systemic theory than to case grammar: frames are paradigmatically organized into a taxonomy. As an example, consider the diagram below, which represents 'tell' as a kind of 'saying', which in turn is a kind of 'process':

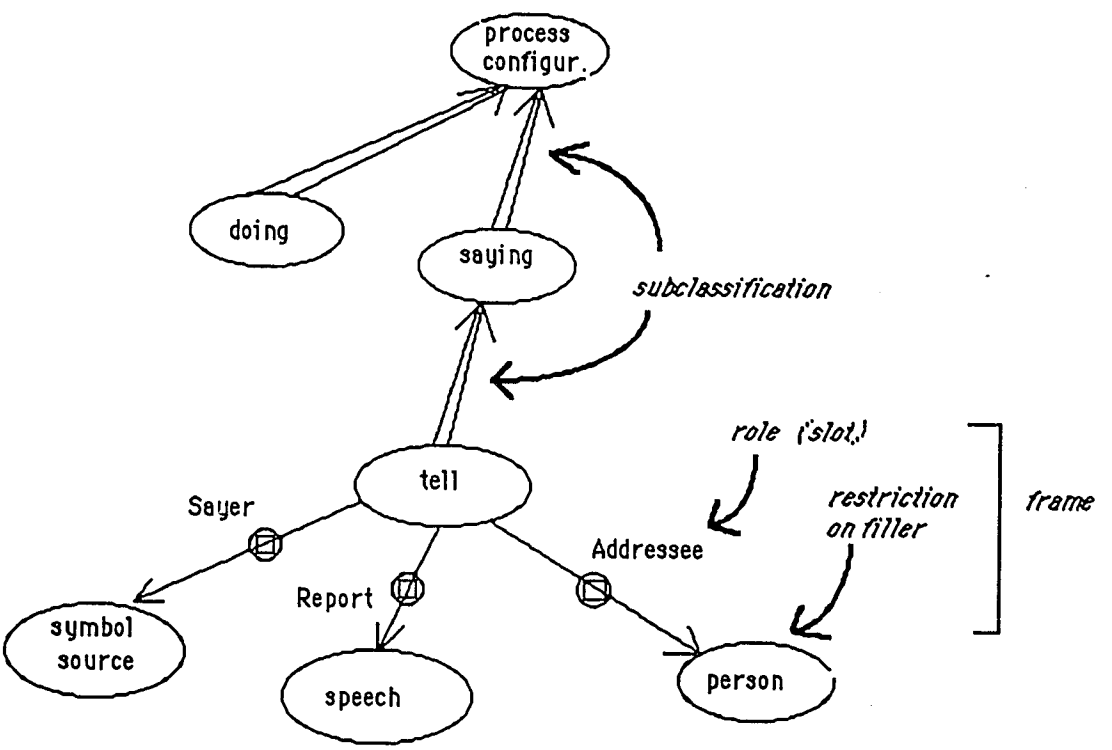


Fig. IV:2-2: The 'tell' concept frame, role fillers, and superordinate concept

(i) The concept unit. The concept unit has structure; as already suggested, it is essentially like a case frame in the transitivity structure of a clause, with a number of roles (slots) filled by pointers to other case frames. These pointers constitute restrictions on the conceptual values of the role fillers -- value restrictions on the roles.[13] For example, if we want to define a concept 'tell' as in the diagram above, we would say that it is a kind of saying and that it has three roles, Sayer, Report, and Addressee. For purposes of illustration, we can say that the Sayer role has to be filled by a concept that is a symbol source (i.e., a human, a document, an instrument, or the like), the Report has to be speech, and the Addressee has to be a person -- or rather anything we can treat as a person (including cats and dogs and other extended family members) or a collective.

(ii) The net. The fragment in Figure IV:2-2 is part of a large **net** of concepts such as the 'tell' concept; the concepts are related taxonomically by a general relation of subclassification[14] and they are also related through the restrictions on the fillers of roles. Let's turn to the taxonomic relation first; consider the following taxonomy, which is an extension of the fragment given in Figure IV:2-2. (As before, subclassification is represented vertically, but I have left off the arrow heads on the subclassification arrows for the sake of convenience.)

---

[13] Cf. the notion of a two-cell tagmeme in Tagmemic theory. The value restriction is comparable to the notion of preselection in Systemic theory.

[14] This corresponds to the ordering of systems in a system network in delicacy. One major difference between the system network and the NIKL taxonomy is that the former is feature-based and the latter is unit- or frame-based.

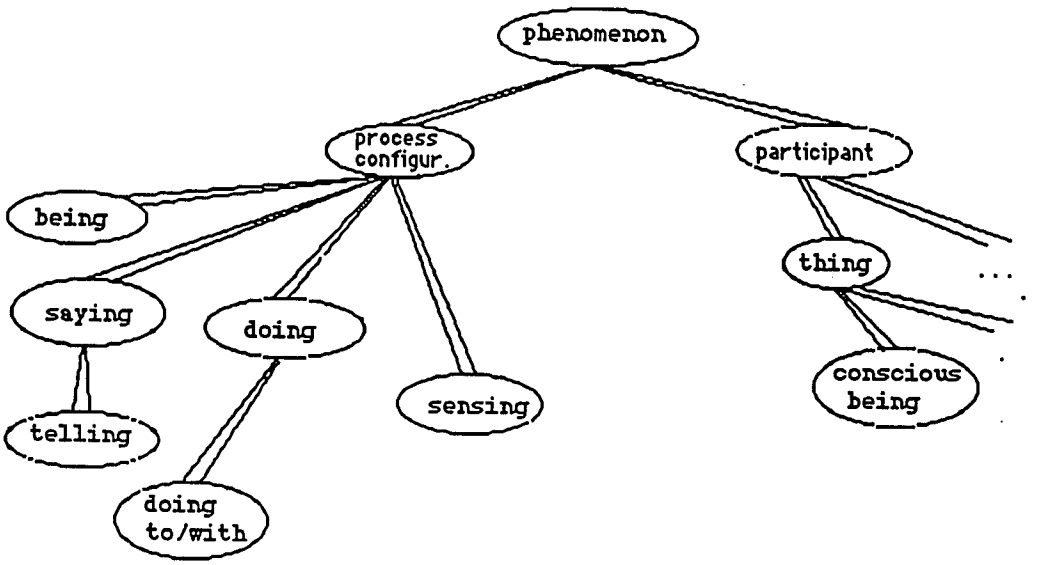


Fig. IV:2-3: Taxonomic relations in net

In addition to the taxonomic aspect of the concept net, the net is made up of role relations. The roles associated with concepts can be restricted to be filled by certain concept classes, the so-called ***value restrictions*** mentioned above. For example, in Figure IV:2-2, the Sayer role is restricted to be a symbol source; in the expanded net, the Actor role can be restricted to be a thing concept, and so on. The role relations give the net a 'horizontal' organization in addition to the 'vertical' taxonomic organization:

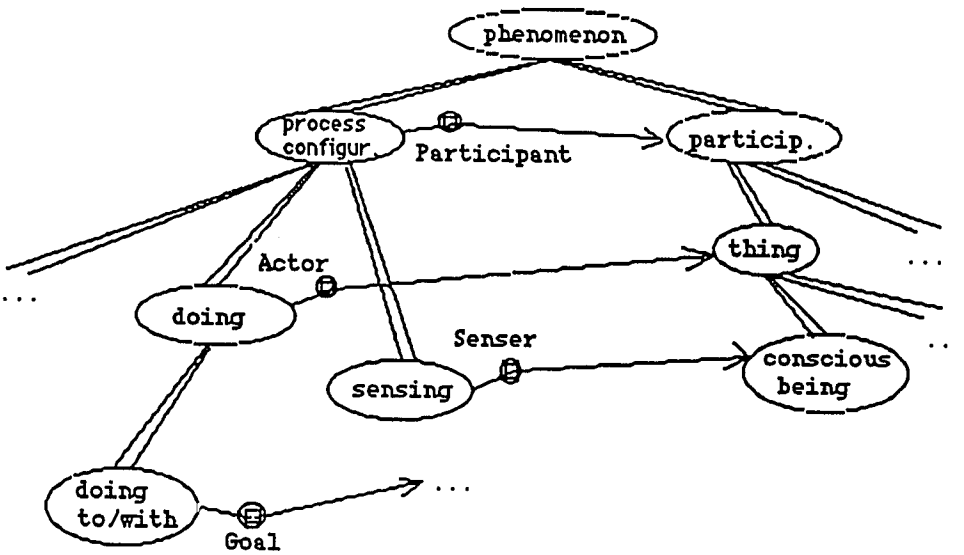


Fig. IV:2-4: Role relations added to taxonomy of Figure IV:3-4.

Roles are also taxonomically related. The Participant role associated with the process concept is further differentiated into two subtypes, Actor and Senser. Any concept ***inherits*** roles and their value restrictions from the concepts they are direct or indirect subtypes of. Thus "doing to/with" inherits the Actor role from "doing".

As far as leading ideas go, the kind of semantic net illustrated above is really like an implementation of Aristotle's notion of taxonomy. There is the taxonomy of genera and species and differentiating attributes as soon as a new subclass is set up (the roles).

The PENNI component contains a collection of specific facts concerning individual phenomena. Each individual instantiates one or more of the general concepts in the NIKL taxonomy.

2.2 Ideation base support: local plans and global organization

We now have a rough picture of what the notation for representation the organization of the ideation base of a generation system may look like and I will now consider the organization itself. I will focus on the most general information of the ideation base, what corresponds to the "TBox" part mentioned above. However, first let's consider what information the grammar needs to have access to. We can take this in two steps:

(i) the grammar needs local ideational plans for clauses, nominal groups, and other grammatical units; and

(ii) these local plans must be supported by the general organization of the ideation base.

The local plans consist of network fragments of instantial concepts. They may be represented in different ways. In a system such as KRYPTON or KL-TWO, they would be represented by means of predicate logic.[15] One-place predicates would correspond to concepts in the general conceptual taxonomy and two-place predicates would correpond to roles. But instead of using

[15] We can assume that the binding quantifiers have been abstracted out, as they are in the Penman system: the logical form corresponds to two graphs, the so-called verbalization graph, a list of predicates and the relations they enter into, and the quantification graph. The verbalization graph is partitioned by the quantification graph. For further details, see Nebel & Sondheimer (1986). Transitivity inquiries are answered by means of the verbalization graphs, while determination inquiries are answered by means of the quantification graph.

predicate logic for the plans, we can also think of these plans as simply being instantial fragments of the frame network described above (which would be more like Sowa's, 1983, model of conceptual graphs). In either case, the predicates or concepts of the local plans are indexed into the general conceptual taxonomy. For example, the proposition that Smith forwarded message 63 instantiates three general concepts; we can represent it informally as follows (setting aside questions of time, instantial variables, and a number of other details):

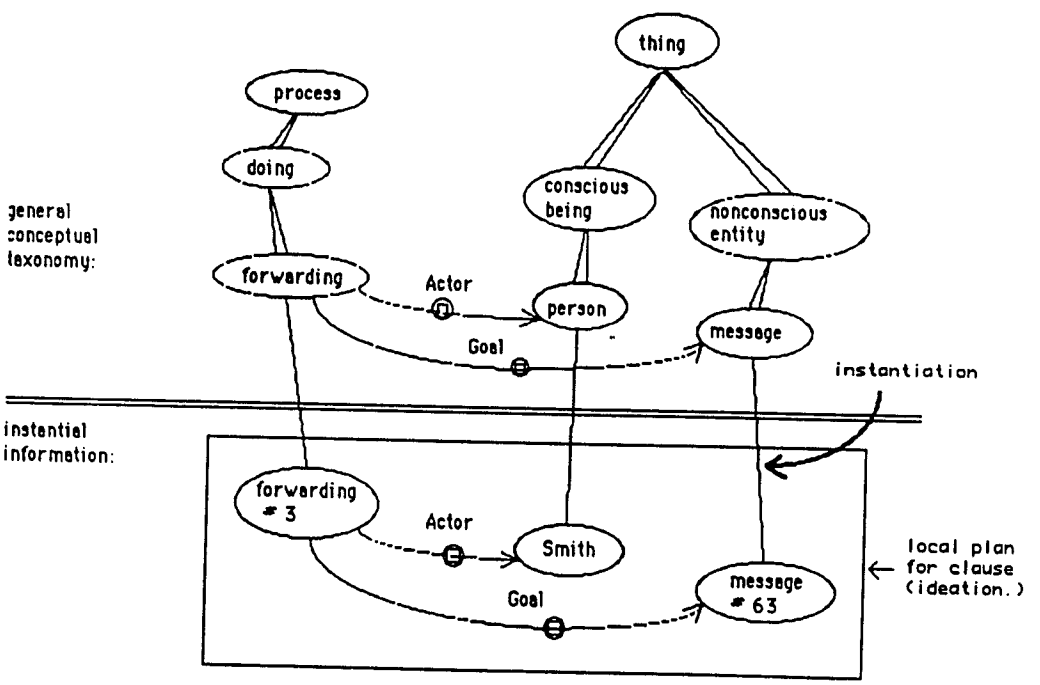


Fig. IV:2-5: Local plan and general ideation base organization

The local plan is the first step in answering identifying inquiries as well as branching ones. An inquiry concerned with the identity of the Process will be answered by associating forwarding # 3 with the function Process. An inquiry concerned with the identity of the Actor of forwarding # 3 will be answered by a consultation of the instantial knowledge: the filler of the instantial concept forwarding # 3 is Smith. The same is true of the Goal and message # 63. The associations indexing into the local plan are diagrammed below.

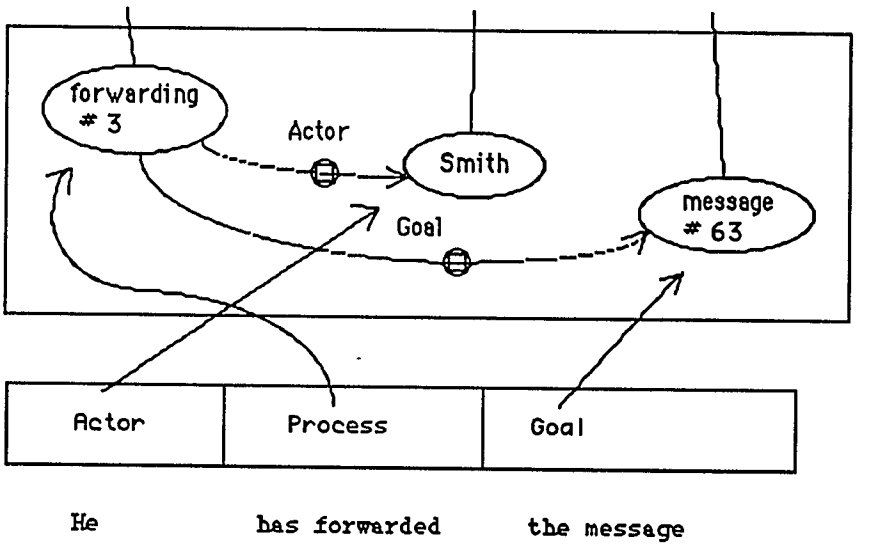


Fig. IV:2-6: Local ideation plan and associations to transitivity structure

Once an association has been established, taxonomic information from the general conceptual taxonomy is now available. For instance, an inquiry concerned with what kind of process forwarding # 3 is will be answered by a consultation of the general taxonomy: it is a kind of doing (I have left out the intermediate classes).

I will now explore the organization of the general conceptual taxonomy a bit further: we have seen how it supports demands for information from branching inquiries and it is demands of this kind that can serve to motivate the organization of this general ideational semantics.

2.3 Global Organization

The ideation base is a model of the **phenomena** recognized by the generator -- a categorial interpretation of reality. The most general notion is thus that of a phenomenon or entity. There are three ranks of phenomena, each one organized on different principles. I will introduce the three ranks and their immediate subtypes in this section; this is part of the Bloomington lattice mentioned earlier and discussed in more detail in Halliday and Matthiessen (in prep.).

2.3.1 The composition of a phenomenon

The most general considerations in the taxonomy of phenomena is composition. Phenomena are simple ('simple or elemental phenomena': thing vs. quality vs. circumstance), configurations of more than one simple phenomenon ('configurations' or 'macro-phenomena'), or complexes of configurational phenomena ('complex phenomena' or 'sequences'). The three ranks of phenomena are organized according to different principles:

• **Complex** phenomena are organized as sequences of interdependent configurational phenomena related causally, temporally, spatially, or by some other type of a small set of highly generalized relations.

• **Configurational** phenomena are organized as configurations of unique parts: a process, participants involved in it, and attendant circumstances. Since a process is almost always involved, we can also call these phenomena process configurations.

• **Simple** phenomena are non-composite, elemental. Simple phenomena are participants, circumstances, and processes. They may have attributes but these attributes do not exist independently of the simple phenomena. (They are related intensively to the simple thing.) A simple phenomenon may, of course, also have parts but these parts again only exist as parts of that phenomenon and not as separate phenomena.

As a rank-based taxonomy, this can be compared to the distinction crystal - molecule - atom.[16]

We have already seen a fragment of the general taxonomy involving configurational phenomena and simple phenomena (of the type participant) in Figure IV:2-4 in Section IV:2.1 above. As an extended example of it, consider the following fragment from the most general part of the taxonomy. I have only represented concepts and left out their roles to avoid cluttering in the diagram.

[16] Jespersen's (1924) grammatical distinction between nexus and junction is comparable to the distinction between composite phenomena (process configuration) and simple phenomena. He writes (p. 116): "A junction is ... a unit or single idea, expressed more or less accidentally by means of two elements. A nexus, on the other hand, always contains two ideas which must necessarily remain separate. ... A junction is like a picture, a nexus like a process or drama."

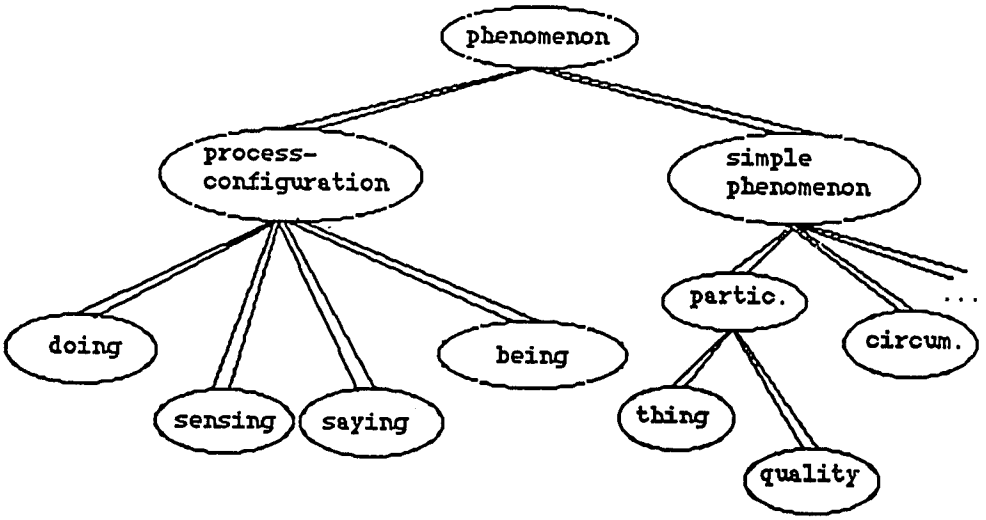


Fig. IV:2-7: A fragment of the most general part of taxonomy

The default grammatical representation of a simple phenomenon is a group.

Since simple phenomena figure in the definitions of composite phenomena as value restrictions, the ***taxonomies*** of these two kinds of phenomena ***proceed in parallel.*** For example, one of the reasons for recognizing 'sensing' as a separate category of process configurations is that the senser role is value restricted to be a conscious being (see Figure IV:2-4 above) and one of the reasons for setting up conscious being as a kind of thing is that it is evidenced as a value restriction of the senser role.[17]

The three general semantic types and their subtypes are charted below.

[17] The same principle is illustrated at greater delicacy within lexicogrammar for (material) processes of gathering and accumulating in Hasan (1987); cf. Section II:4.

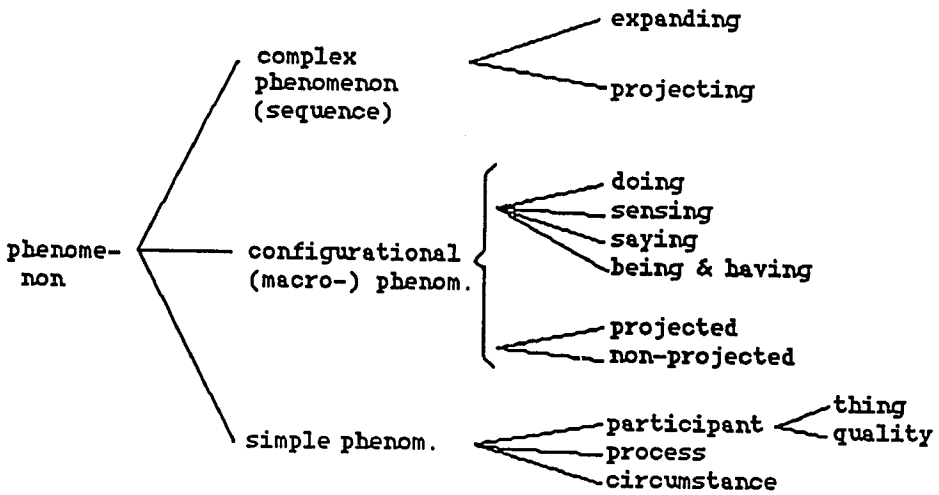


Fig. IV:2-7a: Most general semantic types

The concepts are organized into an inheritance hierarchy. For example, 'simple phenomenon' is classified under 'phenomenon' as a subtype; it inherits whatever attributes 'phenomenon' has.

The most general distinction is, as just mentioned, based on considerations of composition. To simplify, the basic question is "what does the phenomenon consist of; what's the nature of its composition?". And the answer is in terms of a scale from micro to macro: phenomena are simple ones, macro-phenomena (configurations), or supermacro-phenomena (sequences). This scale is reflected in the way in which roles are filled and restricted. The roles of sequences are filled by configurations and the roles of configurations are filled by simple phenomena. There are two important issues to note in connection

with this generalization. One is that, in certain cases (to be noted below), configurational roles may be filled by configurations. The other is that anything can be semanticized as a simple phenomenon. Thus, it is possible to 'zoom' in and out; for instance, a procedure and an algorithm are 'things' that summarize potentially quite complex sequences (cf. also activities, plans, recipes, itineraries; and, with a circumstantial feature, reasons, outcomes, results, purposes, etc.; and, at a different order of abstraction, ideas, notions, facts, etc.). Similarly, the process of baking can also be viewed in terms of a number of much more detailed steps.

We might have based the taxonomy on another very fundamental distinction based not on size but on order of existence: "does the phenomenon exist in reality or does it exist symbolically?". And the answer would have been in terms of a distinction between phenomenon and metaphenomenon. This distinction is, in fact, incorporated into the taxonomy of semantic types above as the distinction between projected and non-projected: projected configurations are metaphenomena and all other phenomena are ordinary and 'non-meta'. From time to time, I will find it useful to highlight the contrast between metaphenomena (projected phenomena) and all other kinds of phenomena.

2.3.2 Semantic types and grammatical classes

There are default ways of expressing the different kinds of phenomena in the grammar. Sequences are coded by clause complexes, complex phenomena by clauses, and simple things by groups. Further, things are expressed by nominal groups, processes by verbal groups, and circumstances by adverbial groups or

prepositional phrases:[18]

SEMANTIC TYPES		GRAMMATICAL CLASSES	
sequences		clause complexes	
configurations		clauses	
simple phenomena	processes	verbal	groups/
	things	nominal	
	qualities	adjectival	
		adverbial	
	circumstances	prepositional	phrases

Fig. IV:2-8: Grammar and the basic semantic (conceptual) distinctions

There are marked, or 'scrambled', ways of coding phenomena in addition to the default strategies given in the table above. These usually involve rankshift or grammatical metaphor (cf. Section II:3.3). For example, a quality may be coded by a (relative) clause through rankshift and a sequence may be coded by a clause, which is a metaphor of a sequence treated as if it were a configurational phenomenon. I will return briefly to metaphors after the main discussion, but will not focus on them; they are discussed in more detail in Halliday and Matthiessen (in prep.). As noted in Section II:3.3, grammatical metaphors serve to represent new semantic categories -- recombinations of congruently coded categories, such as configurational sequences.

[18] There is no bi-uniqueness here. On the one hand grammatical metaphor changes the coding relations; on the other hand, grammatical categories also realize meanings from the interaction and text bases.

2.3.3 Two types of rank scale above configurational phenomena?

The highest-ranking phenomenon mentioned so far in this section is the sequence. As we move up the rank scale, we leave the province where grammar can guide us. It will only guide us as far as the clause complex, which is a sequential kind of organization, but texts or part of texts are not grammatical units; they are semantic units.[19] We can also look to text as a semantic unit and a consideration of text organization suggests both experiential and logical organization. The experiential organization is also likely to be useful for higher ranks of 'knowledge organization'.

A restaurant script (Schank and Abelson, 1977), for example, has a multivariate pattern -- Enter ^ Order ^ Eat ^ Exit -- as does a meal (cf. the daily menu example in Halliday, 1961):

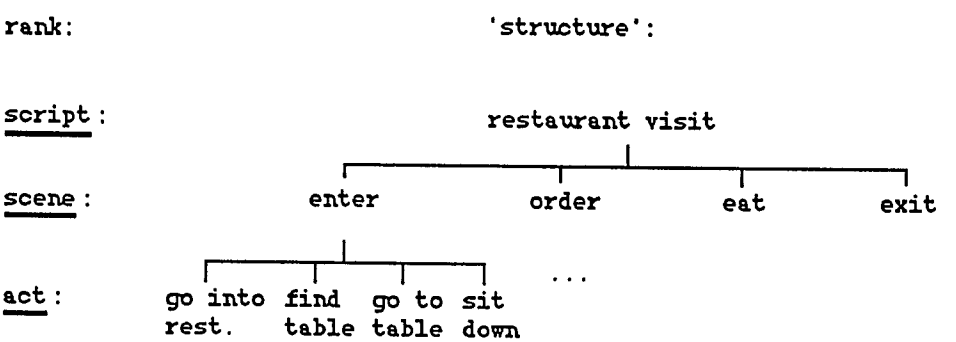


Fig. IV:2-9: Rank and 'structure' in script

[19] There are still two ways in which the grammar can guide us more indirectly. (i) It can can provide us with models of organization. For instance, assuming episodes can consist of many sequences, they can still be organized on the model either of sequences (grammatically: clause complexes) or on the model of configurations (grammatically: clauses). (ii) Lexicogrammatical resources for indicating semantic organization beyond grammatical units tell us something about the nature of this organization. This is particularly relevant in the case of textual cohesive resources and the text base (see Section IV:3).

In this particular example, there are three 'ranks', but it seems plausible that different situations will have different rank scales, just as different situations have different multivariate patterns. (For example, for the discourse of class room interaction, Sinclair and Coulthard (1975) found it useful to operate with five ranks -- lesson, transaction, exchange, move, and act.) Scripts are conventionalized strategies for dealing with situations and the multivariate structure captures this characteristic. There are novel situations, however, for which there are no scripts and here the dynamic univariate mode of organization seems to be a useful strategy. It is likely, then, that there is a complementarity between the two ideational modes of organization.[20]

To sum up: if we take the configuration as a starting point and try to move upwards to larger units, it would seem that we can take either of two paths. We can shift to the logical mode of organization and create sequences, complex configurations. Increased size will essentially simply mean increased complexity with internal nesting but no additional ranks above the sequence. This is what we find in the grammar. Alternatively, we can stay within the experiential mode of organization but work with a number of rank scales specific to particular fields of experience; we can take a context-based approach (cf. Section III:6) rather than a grammar-based one:

[20] This complementarity is evidenced in grammar, of course: the nominal group is simultaneously structured logically and experientially (Section II:3.2; Halliday, 1985: ch. 6).

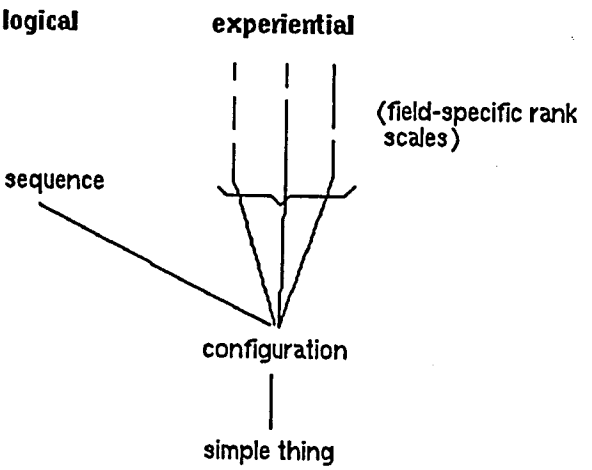


Fig. IV:2-10: Above the configuration: sequence and specific ranks

2.3.2 Sequences

2.3.2.1 The sequential interdependency kind of organization

Sequences are chains whose links are configurational phenomena. Sometimes these sequences are episodes with only two links. For example, a causal chain may have cause and effect as links or condition and consequence. But, more generally, a sequence may extend indefinitely, because it is organized as a chain of interdependent links (logical organization) and not as a configuration of a unique set of parts (experiential organization). To anticipate the presentation of complex phenomena, they are organized as configurations with a unique set of parts. A certain subtype of configurations organize an episode temporally as consisting of three unique parts: the

temporal relation, and the two events related. Consider the following metaphorical semanticization of a temporal episode as a configuration of two events with a coding of the temporal relation between them as *follow* in one clause --

> The terrorist assaults were *followed* by more U.S. reprisals

The configurational organization is diagrammed below, with the three parts 'relation' and the two events related simply labelled '1' and '2'.

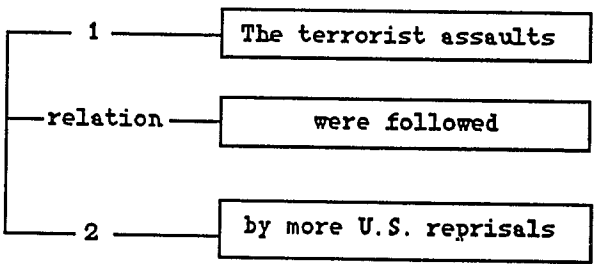


Fig. IV:2-11: Representation of a configuration

Now contrast it with the representation of a sequence by means of a clause complex rather than as a configuration. Both are substeps in procedures:

> If the rotor is not pointing to the mark, pull the distributor part way out, turn the rotor some, and reinsert the distributor until the rotor points to within a half inch of the mark.
>
> Add the remaining ingredients, stir to coat the chicken well and continue until a thick sauce has formed and the chicken is tender.

The organization of the second sequence can be diagrammed as follows. The interdependency relations linking the units in the chain are marked by arrows between pairs of links.

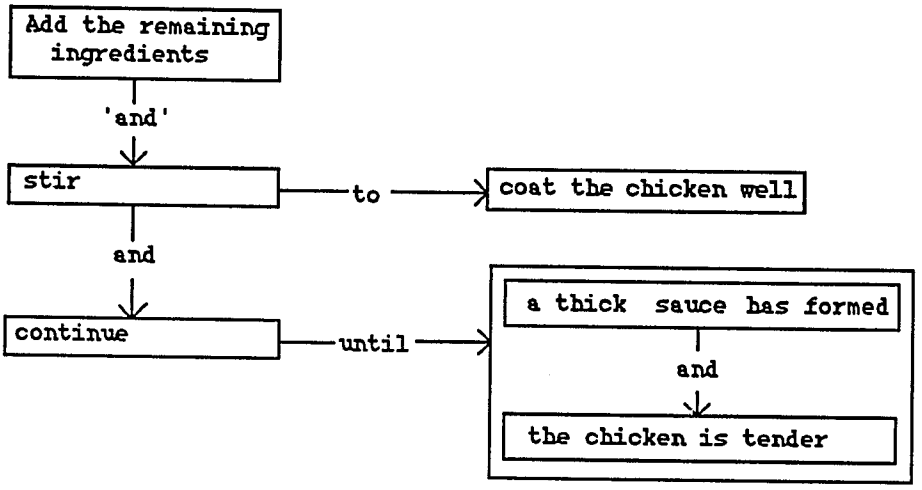


Fig. IV:2-12: Representation of a sequential phenomenon

The phenomenon diagrammed in the figure is organized as a temporal sequence ('and [then]') of three process configurations, 'add', 'stir', and 'continue to stir', two of which are further expanded purposively ('[in order] to') and temporally ('until'). The temporally related unit is itself an additive sequence ('and [also]'). The sequence might have been expanded further, since it is organized as a chain of interdependent units; and in this respect it contrasts with the configuration in Figure IV:2-11 above.

In logic, we find sequences being reflected in propositional (sentential) logic. The logical connectives, &, OR, and -> , correspond to a few of the many logico-semantic relations that make up sequences. Longacre (1976, 1983) and

Ballard, Conrad, and Longacre (1971) present a natural language propositional calculus with a richer collection of logical connectives.

2.3.3 Configurational phenomena

We now come to the second rank of phenomena, configurational phenomena. They are organized on a principle different from that of sequential phenomena; they are organized as configurations rather than as sequences. I will discuss the nature of their organization first and then turn to the most immediate subtypes, (i) material vs. mental vs. verbal vs. relational; and (ii) projected vs. non-projected.

2.3.3.1 The configurational kind of organization

As already mentioned, a complex phenomenon is a composite configuration of a limited set of parts with unique values in relation to the whole configuration. The parts of a given configuration are a nuclear process, one to three different kinds of participants taking part in the process, and up to around seven different kinds of circumstances associated with it.[21] Participants are inherent in the process; they bring about its occurrence or mediate it. There are a number of specific ways in which a participant may take part in a process; it may act out the

[21] Both participants and circumstances have been discussed extensively in terms of (deep) cases in linguistics and computational linguistics, but usually without a distinction between the two. The process is typically not given a deep case.

process, it may sense it, it may receive it, it may be affected by it, it may say it, and so on. The different configurations of participants are the bases for a typology of process types, to be sketched below in Section IV:2.3.3.2. The distinction between participants and circumstances is a cline rather than a sharp division, but is semantically quite significant. Circumstances are typically less closely associated with the process and are usually not inherent in it (cf. Section II:4). They specify the spatial or temporal location of the process, its extent in space or time (distance or duration), its cause, the manner of its occurrence, and so on.

Grammatically, the nuclear process, its participants, and its circumstances are typically represented as constituents in the transitivity structure of a clause. For instance, a particular process of awarding may be represented as having a Time (*in 1966)* , an awardee or, in more general terms, a Recipient (*he*), and a commodity awarded or, more generally, a Goal (*a two-year Harkness Scholarship*):

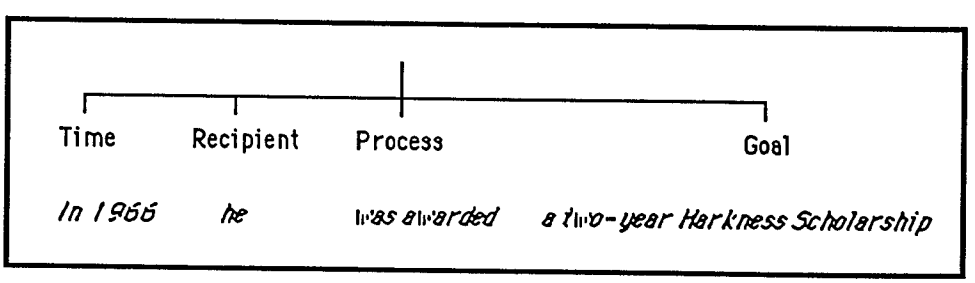


Fig. IV:2-13: The transitivity structure of a clause

In logic, configurations are reflected in the predicate - argument structure of predicate logic. The process typically comes out a predicate and the

participants as its arguments. However, there are significant differences between the way a configuration is represented in predicate logic and the way it is represented grammatically in English. In knowledge representation, a configuration is typically represented as a concept frame with a number of roles (cf. Section IV:2.1). Configurations can be represented in two ways by means of such a frame.

(i) The configuration itself may be taken to constitute the frame (cf. for example Anderson (1983: chapter 3)), much as in the grammatical constituency diagram in Figure IV:2-13 above. The process is represented as a role (slot) in the frame in the same way as participants and circumstances:

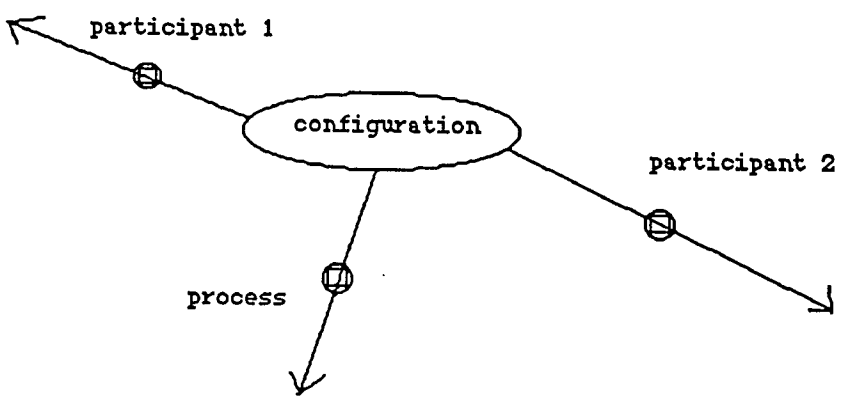


Fig. IV:2-14: Configuration as frame

(ii) Alternatively, the process part of the configuration can be treated as the frame rather than one of the roles of the frame:

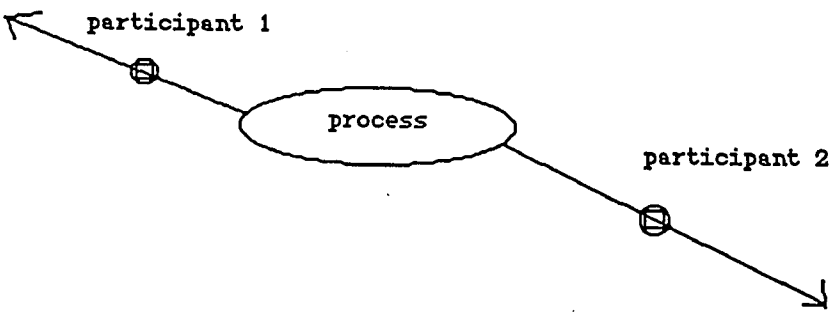


Fig. IV:2-15: Process as frame

In either case, the roles have restrictions on what concepts they can be, so-called value restrictions. They are themselves concepts from other parts of the conceptual taxonomy not included in the figure, which will be indicated here by presenting them in square brackets. The two representations make different claims about a configuration, of course. In particular, the first approach allows the process to be role that is filled by another concept frame that may have its own internal organization. As we will see below (Section IV:2.3.4.1), the process part of a configuration may indeed have internal organization. At the same time, the second approach is simpler and it may be sufficient for many simple generation purposes.

If we use the first approach, we can see that a configurational frame is made up of three kinds of roles, (i) the process role, (ii) participant roles, and (iii) circumstance roles. Each type has a default filler from the hierarchy of simple phenomena, processes, participants, and circumstances respectively.

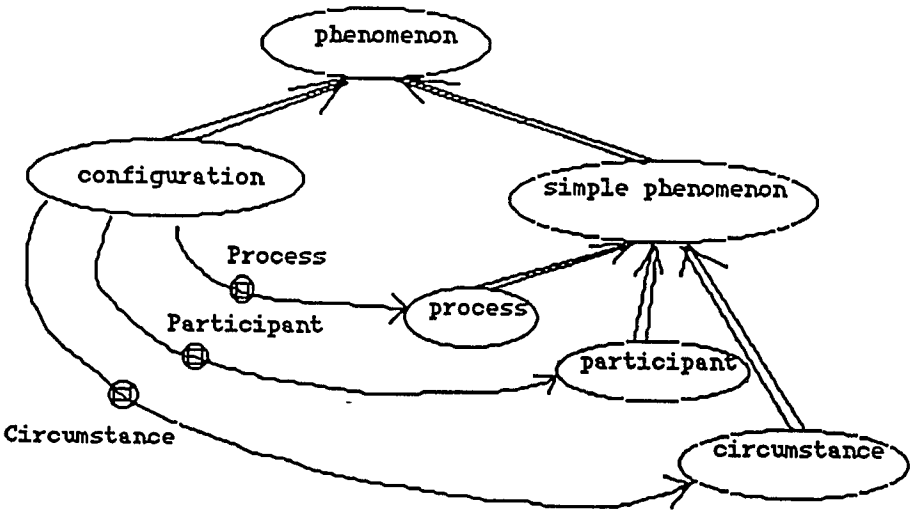


Fig. IV:2-16: Configuration with role types and role fillers

As already mentioned, there is a taxonomy of configurations and it is based largely on the nature of the particular types of the general process, participant, and circumstance roles. Configurations, just as concepts in general, are thus organized into an inheritance hierarchy (cf. Figure IV:2-4 above) and the subtypes of the configuration frame classified under it inherit its role configuration, which applies also to domain models classified under the general model. I will now turn to the taxonomy of configurations.

2.3.3.2 Subtypes of process configurations

There is a small number of configuration types that can be recognized on various grounds (for lexicogrammatical considerations, see Halliday (1985: Ch.

5): doing, sensing, saying, and being and having. Since they are always reflected in the nature of the process part of a configuration, they are called process types. These and their most immediate subtypes are given in the figure below, based on the interpretation presented in Halliday (1985).

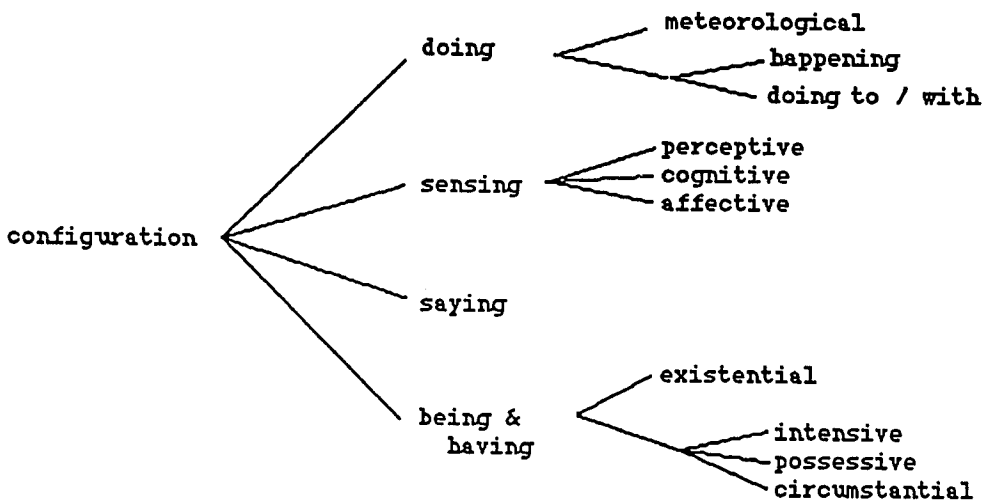


Fig. IV:2-17: Organizational types of configurations

I will describe the various process types in more detail presently. In the meantime, the four major types can be glossed as follows. Each process type has its own set of roles with particular value restrictions and number restrictions.

- **doing**: world of material reality -- doings or happenings; some input of energy is needed for the process to take place. Doings have an actor which is a thing (rather than any kind of phenomenon). Meteorological configurations have no Actor, which is allowed by a number restriction

associated with Actor, (0,1), where the first number is the minimum number of Actors and the second is the maximum one.

• **sensing**: world of consciousness -- sensing by a conscious being of a phenomenon; the sensing is inert on the part of the conscious being rather than active. Sensings have a senser, the participant whose consciousness is involved, and potentially also a phenomenon, the participant that enters into or is brought into being by the senser's processing. The senser role is value restricted to 'conscious being' (non-conscious beings may be personified if they are treated as sensers).

• **saying**: world of symbolization -- saying by some kind of signal source; the saying may or may not be actively performed by the signal source depending on its nature. Configurations of saying have a sayer role -- the participant restricted to be a signal source. Signal source is a semiotic notion rather than a biological one; it includes documents and instruments of measurement as well as (human) speakers -- anything that is semiotically interpretable. In addition to the sayer, there may be an addressee, which is typically but not necessarily a conscious being, a verbalization, and a subject matter (the 'topic' of saying).

• **being and having**: world of various modes of being -- being or having; in the limiting case it is the existence of one participant, but it is almost always a relation between two participants. The participant we always find might be called the be-er; there are more specific participant roles depending on the subtype. The be-er can be any phenomenon.

The four types of configuration and their most general roles and value restrictions are summarized diagrammatically below.

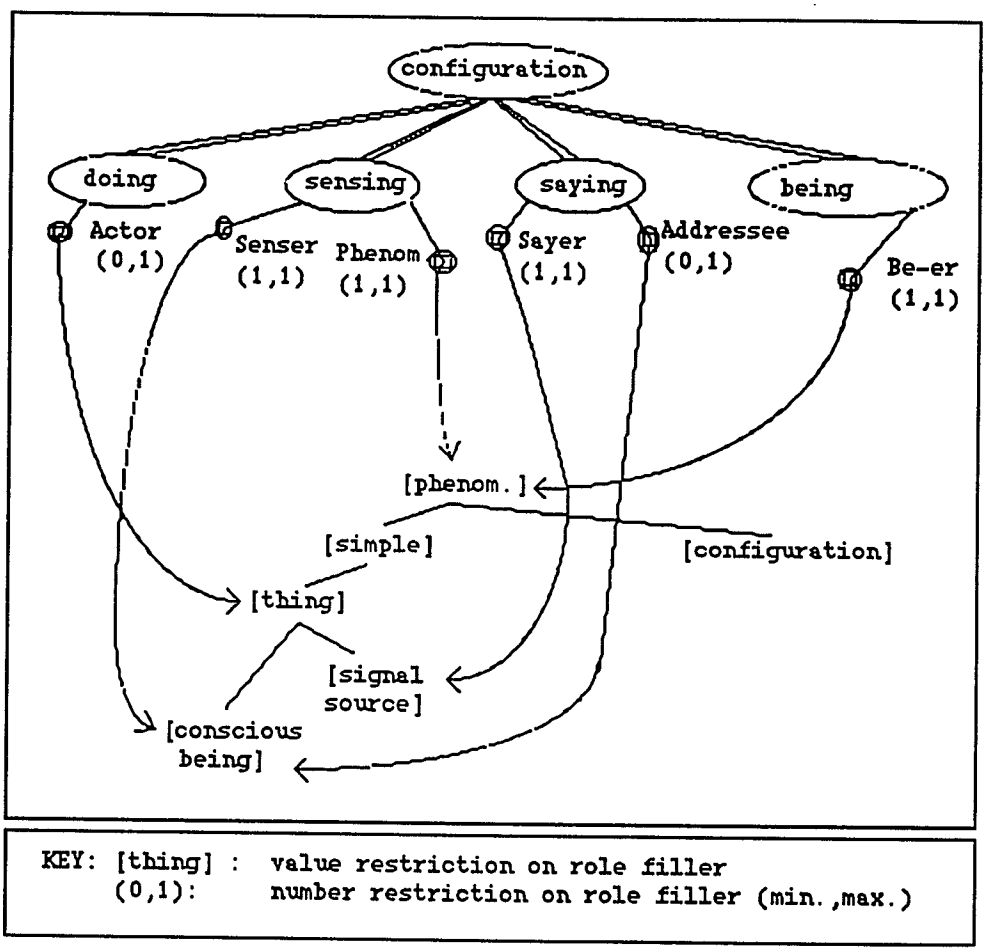


Fig. IV:2-18: Subtypes of processes in the concept hierarchy

This picture is, of course, neither exhaustive nor exceptionless; rather, it is indicative of the general principles. It illustrates how the taxonomy of configurations proceeds in parallel with the taxonomy of things; we would see this more clearly if we had pushed towards more delicate subtypes. It also

illustrates part of the ideational interpretation of the world -- the configurational taxonomy and the restrictions on participant roles. For instance, while a be-er can be most any phenomenon, an actor is further restricted.

The process types are reflected in the grammar of transitivity. The most general TRANSITIVITY distinctions are grammatical rather than lexical. That is to say, they have general structural consequences; they determine the number and the nature of participants that are present in the clause. For instance, configurations of saying are coded by verbal clauses, which have a Sayer and may have an Addressee. The verbal clause may combine with another clause which constitutes a quotation or a report of what is verbalized: *he said || he still considered himself president of the Philippines.*

In the congruent case, doings are expressed by material clauses, sensings by mental ones, sayings by verbal ones, and beings and havings by relational ones. Grammatical metaphor may change these realizational relationships. For instance, doings may be represented by relational clauses under certain circumstances, as in the representation of the activity of patrolling, *he's on patrol,* and the representation of the sense of fear, *who's afraid of Virginia Woolf?* The four transitivity types are set out in the table below, with one example for each type. The structure of a material clause was illustrated above for the process of awarding (Figure IV:2-13).

	congruent					metaphorical; e.g.:
doing	material	Actor *I*	Process *'m making*	Goal *lasagna*	*for dinner*	↴
sensing	mental	Senser *I*	Process *like*	Phenom. *lasagna*		↴
saying	verbal	Sayer *I*	Process *told*	Addressee *him*	*that I like lasagna*	
being & having	relational	Attr. *This*	Process *is*	Attribute *lasagna*		*I'm in the process of making I.* *I'm fond of lasagna*

Fig. IV:2-19: Examples of realizations in the TRANSITIVITY grammar

2.3.3.3 The reality of a configuration: projections vs. non-projected configurations

In the previous section, I discussed the four basic types of configurational organizations -- doings, sensings, sayings, and beings and havings. Configurations also differ in terms of what kind of reality they refer to. They are either projections (meta-phenomena) or non-projected phenomena.

Non-projected phenomena are the phenomena we interpret as we meet them in the external world and the world of our own consciousness; we interpret them by language. They include everything that we can name by lexical items: stones as well as beauty, running as well as houses, governments as well as mothers, trees as well as pain and love, running as well as rain drops, and so on. An independent clause like *The earth is flat* names a

macrothing, i.e. a process configuration; it is a composite name (a 'macro-name') for a composite phenomenon (a 'macro-phenomenon') in reality.

In contrast, **projected phenomena** (meta-phenomena) are already interpreted by language, or, more generally perhaps, by a semiotic system. They are already meant or said; they are meanings or sayings (Halliday, 1985: Section 7.5). They do not exist in the 'real' world, but only in the semiotic world of meanings and sayings; their existence is symbolic. If we want to name them, we typically have to use dependent clauses that project a meaning or saying rather than constitute one like independent clauses. Thus, to represent somebody's belief/claim, we would say (*My neighbour thinks/says) that the earth is flat.* If we believed in the correspondence theory of truth, we would check independent clauses against reality (i.e. things, in particular acts) and dependent clauses representing projections against semiotic reality. We can see the difference between non-projected phenomena and projected ones quite clearly when they enter into the representation of somebody's perception. Contrast Henry's perception of an act of somebody smoking -- *Henry saw Anne smoking in the living room* -- with Henry's perception of the fact of somebody smoking -- *Henry saw that Anne was smoking in the living room.* In the first case, Henry sees the act occurring in reality, while in the second case he only deduces the fact; cf. further Kirsner and Thompson (1976).

The difference between the representation of a non-projected phenomenon and a projected one is summarized in the table below.

	non-projected phenom.	projected phenomenon
kind of reality --existence	the 'real' world non-symbolic	semiotic reality symbolic
representation	*The earth is flat*	*He said/thought that the earth is flat*

Fig. IV:2-20: The notion of projection

2.3.4 Simple phenomena

While configurational phenomena enter into sequences, simple phenomena fill the roles of configurational phenomena. Participant roles are filled by participants (things or qualities), circumstance roles by circumstances (times, places, causes, etc.), and the process role by a process. As we have already seen, there are correlations here between the taxonomy of configurational phenomena and that of simple phenomena: the diagram in Figure IV:2-18 summarizes the value restrictions on the fillers of the different participant roles of the four process types. I will now discuss processes, participants, and circumstances.

2.3.4.1 Processes

A process functions as the nuclear part of a configuration of this process, participants, and circumstances; the process fills the Process role. The Process is the nucleus in a configuration of inherent participants. But the process filling the Process role has its own internal organization, reflecting various aspects of the occurrence of a process. A process is instantiated, i.e., occurs or happens, in time; thus, it is locatable at a time of occurrence ($t_{process}$). In this capacity as a phenomenon defined in the temporal dimension, a process is represented by a verbal group; for example (the last two examples, noted by Halliday (1979: 63), are from natural spontaneous speech[22]):

[This soup] *comes* [from Northern Thailand]
Simmer [for 15 minutes]
Continue to boil
Continue cooking and stirring [for 15 minutes]
[They] *will not require* [any further cooking]
[It] *'s been being occurring* [to me for some time]
(Halliday, 1979: 63)
[Our plant] *'s going to be having been* [without water for three days] (op cit.)

2.3.4.1.1 Time and occurrence

The occurrence of a process may be related to the actual here-and-now of the act of speaking in various ways. It may be related as an actual occurrence located in time relative to the time of speaking by one or more steps. The

[22] It is here that more complex tense selections tend to occur just as the intricacy of clause complexes in spontaneous speech can be quite high (cf. examples in Section II:3.2). Perhaps because of the unself-conscious nature of spontaneous speech (as opposed to a good deal of written discourse), speakers may frown on perfectly natural examples if they are asked to reflect on them consciously and judge them.

occurrence may be partial, it may be usual, it may be incidental, and so on. A number of possibilities are set out in the table below. The first set are TENSE and MODALITY. They can be expressed by any finite verbal group. The second set draw upon a combination of two or more verbal groups for expression (cf. Halliday, 1985: Section 7.A.4-6). But both sets represent a single process role in a process configuration. Its occurrence may be partial, apparent, or attempted; but it is still a single process role.

	process: series from actual to potential		
class	*verbal group (complex)*		
functional region	TENSE: MODALITY:	will have left may have left	
	TIME PHASE: REALITY PHASE: CONATION: TIME MODULATION: etc.	(will) begin (will) seem (will) try (will) tend	to leave /be leaving to leave /be leaving to leave /be leaving to leave /be leaving

Fig. IV:2-21: The occurrence of a process -- time, phase, appearance, etc.

(1) A note on TENSE and MODALITY

The occurrence of a process in the ideation base may be related temporally to the occurrence of the act of speaking, i.e. to the ongoing interaction of the interaction base. The occurrence of the act of speaking is the actual here-and-now. The time of the process occurrence is related to 'now' in one or more

temporal steps. The first step may in fact be modal rather than temporal: an assessment of the probability etc. in relation to the actuality of the act of speaking.

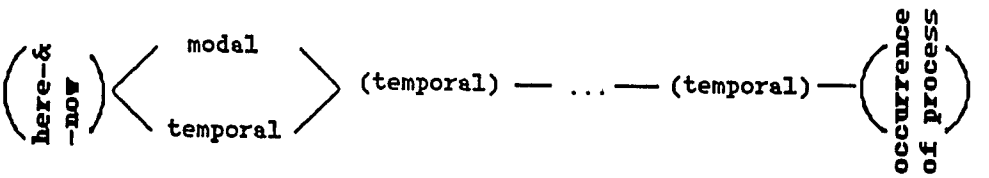


Fig. IV:2-22: Here-and-now related to the occurrence of a process

The resources of TENSE in English allow us to express a chain of times with 'now' and the time of the occurrence of the process as endpoints (see Matthiessen (1983, 1984) for details); they allow us to select repeatedly from the system past vs. present vs. future. The grammar of TENSE reflects a representation of time that enables us to formalize serial time; this amounts to a generalization of Reichenbach's (1947) temporal system with three times (cf. Matthiessen (1984: 63-4)). As an example, consider the following excerpt from a short biographical note on Stephen Crane.

> In 1885, the young author, who [1] <u>had</u> never <u>seen</u> a battle, [2] <u>published</u> *The Red Badge of Courage,* the extraordinary revelation of the mind and heart of a raw recruit.

There are two verbal groups, underlined and numbered in the excerpt. Both realize selections of a past tense. Verbal group [2], *published,* realizes this past tense selection alone; it is a simple past (realized by *-ed*). The past tense relates the time of publishing, which is located by a temporal circumstance (*in*

1885) to the time of writing the bibliography ('now'); the former time precedes the latter. Verbal group [1] occurs in an elaborating dependent clause that gives some additional information about Crane. It realizes an initial (primary) past tense selection (*-ed*), followed by a secondary past tense selection (*have ... -en*): *had seen;* it is a past in relation to a past. The second past tense selection locates the time of seeing as prior to another time (*in 1885*), which in turn is located as prior to the time of writing ('now'). Thus, there is a chain of three times, whose endpoints are the time of writing and the time of seeing: $t_2 < t_1 < t_0$. The temporal relations are diagrammed in Figure IV:2-23 below.

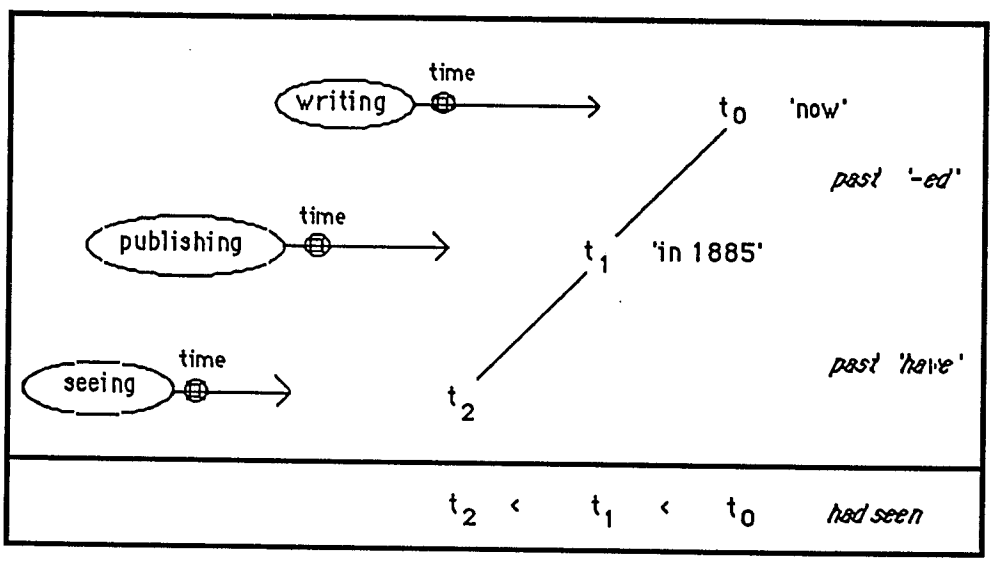


Fig. IV:2-23: Time chain with three times expressed by secondary tense

The English TENSE resources require an encoding of serial time, as already mentioned, but they also require temporal planning facilities to enable the system to decide to use the strategy of a flashback (as in the example above), a flashforward, and so on. These issues have to do with the organization of the

text being generated rather than simply temporal relations in the knowledge base.

(2) Expansions: PHASE etc.

As the table in Figure IV:2-21 suggests, the instantiation of a process may be partial, just beginning (TIME PHASE), it may be apparent rather than real (REALITY PHASE), it may be attempted (CONATION), it may be usual (TIME MODULATION), and so on. In the grammar, the process is built up step by step on the same principle as tense, taking the actual here-and-now of the act of speaking as the starting point. For example, the tendency of the appearance of the beginning of leaving is built up as follows. First, *tend* is produced, then it is modified to be *tend to seem* (i.e., a tendency to seem, rather than *tend to try, tend to turn out, tend to begin,* or any of the other possibilities), then *seem* is modified to be *seem to begin* (i.e., an appearance of beginning, rather than *seem to try, seem to stop, seem to continue,* etc.), and then, finally, *begin* is modified to *begin to leave* (i.e., a beginning of leaving, rather than *begin to try, begin to seem, begin to come,* etc.). The result is *tend to seem to begin to leave.* The diagram below shows how this process is built up in a taxonomic fashion in a way similar to *pudding, fig pudding, Christmas fig pudding,* and *English Christmas fig pudding* or *Henry, Henry my friend,* and *Henry my friend the king:* 'tend to seem to begin to leave' is a kind of 'tend to seem to begin', which is a kind of 'tend to seem', which is a kind of 'tend'.

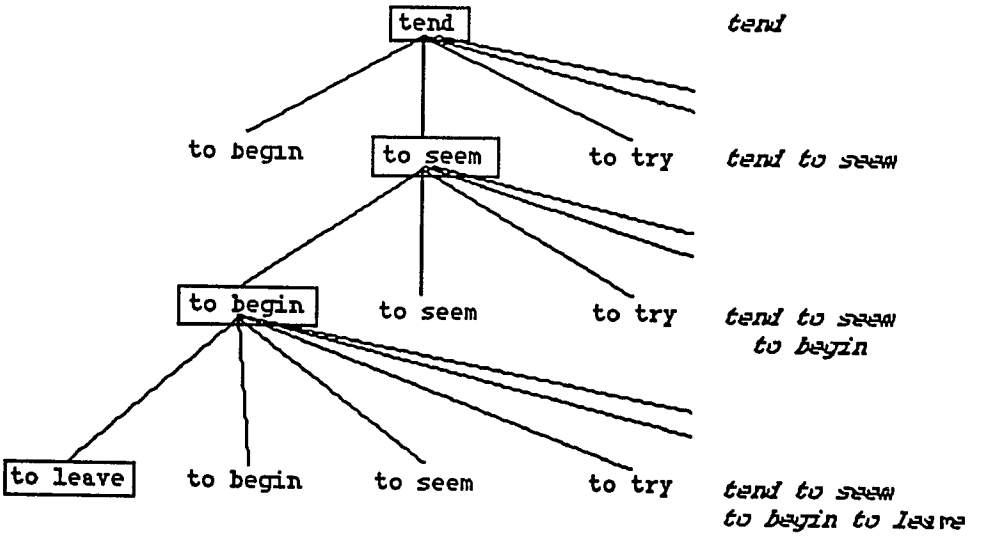


Fig. IV:2-24: Building up a process taxonomically

2.3.4.1.2 Configurations and processes

As we have seen now, there are two perspectives on a process, its role as a part in a configuration together with participants and circumstances; and its internal organization as a series of steps from actual to potential. For example, *will have left* is the Process part of *They* <u>*will have left*</u> *by now;* but it also has internal organization *will -> have -> left:*

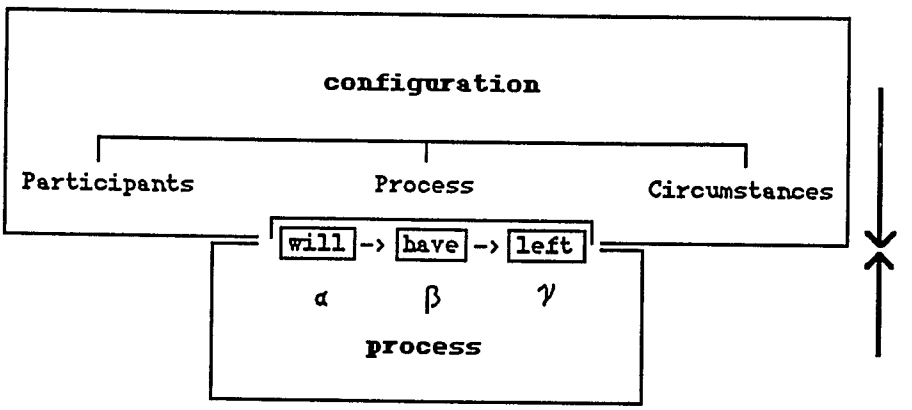


Fig. IV:2-25: The two perspectives on a process

The two perspectives are associated with different grammatical classes, clause (for the participant organizing perspective) and verbal group (for the temporal instantiation). The difference between the two perspectives has been obscured for two reasons. In linguistics, syntacticians have tended to fail to recognize the unity of the verbal groups. They have favoured a division into Auxiliary and Verb Phrase and parts of verbal groups complexes have been dislocated as higher verbs (e.g. *seem*). In philosophy, natural language philosophers have often not teased apart considerations the two perspectives when they develop their event typologies.

Different kinds of configurations are recognized on the basis of the nature and organization of their participant, circumstance, and process parts. Now, we can also consider a taxonomy of processes based on their occurrences in time. The distinction most commonly drawn is based on change. Is there change over time or not; i.e. is there a change in the course of the occurrence of the process? The most common dichotomy is state vs. non-state (change; dynamic); it has

been favoured both by philosophers (cf. e.g. Nordenfelt (1977) and his references) and by linguists (cf. e.g. Quirk et al (1985) and their references). States and non-states have different temporal profiles. States are homogeneous; at any time we check a process whose occurrence is a state, it will be the same. Non-states or changes are not homogeneous; during the course of the occurrence of a process something will have changed, for example the spatial location of a participant (as with processes of movements) or parts of a participant, or some other attribute of a participant (e.g. possession or location in a 'quality space' such as colour or temperature).

Non-states have been further subdivided into telic ones and atelic ones. (i) The occurrence of an atelic non-state is not bounded in time and can extend indefinitely and in this respect they are like states (cf. Nordenfelt (1977); Ehrich, 1987). They correspond to Vendler's (1967) activities. Processes of motion without a designated destination are typically activities. (ii) The occurrence of a telic non-state is bounded in time; its extension in time is finite and the occurrence ends in a state. The change may either be fairly homogeneous and accumulative throughout the occurrence of the process, Vendler's accomplishments, or it may be a fairly sudden threshold kind of affair, Vendler's achievements. The taxonomy is summarized below.

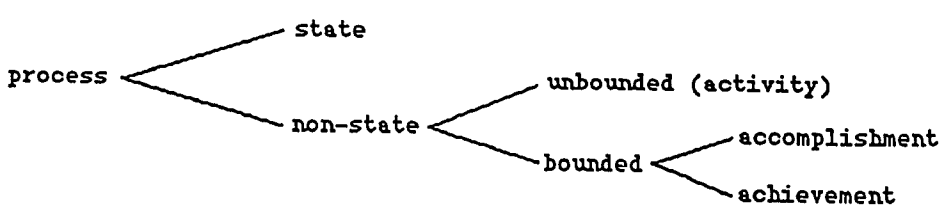


Fig. IV:2-26: Process taxonomy based on temporal profile in occurrence

When the process of a configuration of doing occurs, one or more of its participants undergo a change; somebody running changes location, giving a present to somebody changes the ownership, heating water changes the temperature, somebody reddening changes colour, breaking a glass changes physical composition, and so on. In contrast, the process of a being and having configuration typically has the profile of a state when it occurs, but becoming entails a change into a state ('coming to be') and it is still the same type of configuration in English.[23] The occurrence of the process of a sensing configuration is probably usually a state, but forgetting, remembering, and realizing all seem to imply change. Furthermore, marked tense choices may change the correspondence we expect between a process type and an occurrence type; *I'm liking Henry less and less* indicates the beginning of a change of a process of sensing. The occurrence of the process of a saying configuration can be either a state or a non-state depending on various factors such as the nature of the the filler of the sayer role (contrast *The sign says ...* with *Henry's telling Eliza a story*). The tendencies just noted are summarized below.

	non-state	state
material Process:	✓	
verbal Process:		
mental Process:		✓
relational Process:	(becoming)	✓

Fig. IV:2-27: Configuration types and process occurrence types

[23] That is, it is configured in the same way with an attribuend, a process of ascription, and an attribute, as in '(attribuend:) Henry - (process:) was / became - (attribute:) tired'.

When we turn to the subtypes of non-states that have been recognized, the correspondences between configuration type and temporal profile become very specialized and more brittle. For example, many depend on the presence of a particular participant and, if it is present, on whether it is in finite or in infinite supply. Thus, *Henry read [all day]* is an activity, *Henry read a letter from his lawyer* is an accomplishment, while *Henry read letters [all day]* is again an activity. Furthermore, choices affecting the internal organization of the process may override the correspondencies. The systems of TEMPORAL PHASE are concerned precisely with the temporal phases of the occurrence of a process ('begin', 'keep', 'stop' &c.). Thus, while *read* may denote an activity, *stopped reading* does not. And the accomplishment *Henry read a letter from his lawyer* may be turned into an activity: *Henry kept reading a letter from his lawyer.*

I will not explore the correspondencies further, but I think we can conclude that we cannot expect any clear-cut ones; they may even vary on a case-by-case basis. This lack of clear-cut correspondencies is a good reason for not trying to build distinctions based on temporal profile into the configurational taxonomy sketched above (Section IV:2.3.3.2).

2.3.4.2 Participants

There are two kinds of participants, things and qualities.[24] Things can fill any participant roles in a configuration, but qualities are much more restricted. In effect, they can only occur as Attributes, either in ascriptive relational configurations or in material configurations denoting the result or condition of

[24] Alternatively, we could interpret qualities as always being qualities of things, just as quantities are quantities of things.

the performance of the Process.

This is [Attribute:] delightful (relational)

until the mixture becomes [Attribute:] thick (relational)

Serve [Attribute:] hot (material)

It can be eaten [Attribute:] raw (material)

	participant	
	thing	quality
Attribute	✓	✓
Other roles	✓	

Fig. IV:2-28: The potential of things and qualities as participant role fillers

2.3.4.2.1 Things

Things prototypically exist in some 'space' and many endure through time. Consequently, instances of things can usually be recognized as individuals, and, once established in a text, they can be referred to again. The most favoured (humans, pets, etc.) are usually given individual (proper) names. The mode of instantiation for things is existence, not occurrence as for processes. Although processes occur, their occurrences are not recognized as individuals in English; there are no proper names for processes as there are for things.

(1) Organization

Things are not defined in terms of a configuration of independent parts whose participation constitute the occurrence of them, but they can have various attributes such as material, colour, size, age, intelligence, and weight. The attributes of a thing are intensively related to it: they *are* the thing; they apply to the same referent when the thing is instantiated. Consequently, a delicious pungent piping-hot stew remains one simple thing, one stew.

(2) Taxonomy of things

Prototypical things are persons, animals, and concrete inanimate discrete things, but things also include concrete substances, and abstractions. (As already noted, things also include procedures, algorithm, events, recipes, stories, plans, and other 'distillations' of complex activities: Section IV:2.3.1. There are corresponding processes together with which they form configurations -- designing, revising, and so on.)

The taxonomy of things in English is quite deep and intricate. I will simply draw attention to the most general distinction between *conscious beings* and *non-conscious ones,* or perhaps better, between beings we endow with consciousness and those we do not. The distinction is a particular interpretation of how classes of things differ; it may not correspond to a biological-scientific one.[25] It is reflected in value restrictions on participant roles in the process

[25] Persons are the prototypical conscious beings, but pets and higher animals (though not necessarily babies) are often included; the line depends on the field of knowledge and is drawn in different ways in technical and non-technical fields.

taxonomy; in particular, the senser of a sensing is restricted to be a conscious being. This kind of interaction between the thing taxonomy and the configurational taxonomy is an illustration of a very general phenomenon: There are groupings of kinds of processes and kinds of things. As Halliday has observed, the tightest restrictions tend to occur between the process and its medium. For example, we find this in the area of processes of 'sounding' by animals: bark + dog, neigh + horse, moo + cow, and so on (cf. Section II:4).

The distinction between conscious and non-conscious being is also reflected in the pronominal resources of the nominal group, in the choice between *he/she* and *it; who* and *which,* and so on. Further, distinctions are, of course, based upon the kind of qualities that can be ascribed to a thing and the other things it can be related to.

(3) Classes and instances

Things are represented by nominal groups, where MODIFICATION is used to describe and characterize a thing; to represent its attributes, and DETERMINATION is used to establish and reidentify, i.e. to refer to, instantiations of a thing in a text.

These two functional regions take two different perspectives on a thing (cf. processes above). The first perspective is experiential or, more generally, ideational. It treats a thing as a class in a taxonomy of classes. As a class, a thing is definable in terms of attributes that do not vary from one context to another, e.g. those already mentioned.: material, colour, etc.. For example,

large black sheep is organized as Size (*large*) Colour (*black*) Thing (*sheep*). These are attributes we find in the ideation base. Using the term informally, we can say that this is a thing as an intensional category.

The second perspective is essentially textual. It treats a thing as an instantiation of a class; it is the perspective on the thing as a referent. As a referent, the thing is introduced and reidentified in a text by means of context-specific categories such as identifiability, proximity, and person, i.e. categories that have to be handled by a dynamic discourse model: *these/those/my (large black sheep)*. Using the term informally, we can say that this is a thing as an extensional category.[26]

2.3.4.2.2 Qualities

Qualities define things, serving as their attributes. They do not seem to have independent existence (like things) or occurrence (like processes).

Qualities are typically experientially simple. They specify a value on a single dimension like colour (e.g. red), taste (e.g. sour), sex (e.g. female), maturity (e.g. adult), size (e.g. giant), affect (e.g. sad, happy), and probability (e.g. certain, probable). In this respect, they contrast with most types of things. The latter are typically experientially complex. Qualities accrue to a thing and it is to be defined along several dimensions. For example, contrast the quality "adult" (named by an adjective) with the "adult" (name by a noun). The former is just a specification of maturity and can be applied to many different kinds of animal.

[26] But it may also include subtypes. In Section IV:3, I will introduce the notion of 'representative' and the distinction between potential and current representatives.

The latter, as in *an adult,* is (at least in the vernacular) also human; cf. also nationality concepts, e.g. a Greek 'human being and citizen and of Greece' vs. Greek 'of Greece'.

One consequence of the distinction between things and qualities in terms of experiential complexity is that things can have a variety of attributes, i.e. a variety of roles, e.g. size, weight, value, colour, virtue, and intelligence; but qualities usually only have intensity (if they are scalable).[27]

Another consequence of the difference in experiential complexity is that the taxonomy of things seems to be much deeper and more intricate than the taxonomy of qualities.

It has been suggested that qualities are typically less stable through time than things, that they are between things and processes on a scale of time stability (cf. Givón, 1979, on nouns, adjectives, and verbs). There are certainly interesting correlations in this respect, but it is not clear that time-stability is a very reliable criterion (cf. Thompson, 1988).

Qualities are represented by adjectival groups, which allow for modification (typically intensification, as in *fairly dark*) but not for determination, or by adverbial groups (*They hinted darkly that this was only the beginning*).

[27] Some types of quality are more structured; for instance, relational qualities, which are inherently comparative (similar, identical, equal, different, etc.).

2.3.4.3 Circumstances

Circumstances resemble things in that they are typically used in a configuration around a process. But they are less intimately related to the nuclear process. Things actually participate in the process in some role. Circumstances include time, place, cause, means/instrument, and manner. They are expressed by adverbial groups (e.g. *yesterday, microscopically*) or prepositional phrases. In the latter case, we can see how a circumstance (e.g. *in the house*) can be analyzed as a relation (a kind of process) and a thing, i.e. a preposition *in* plus a nominal group *the house.* In this respect, many circumstances are perhaps more like macro-things (processes) than like simple things (things and qualities).

2.3.5 Metaphor

The taxonomy as discussed up to this point represents the basic outline of semantic (conceptual) types. It can and should be elaborated by adding further detail. It could be extended by adding further subtypes at particular nodes. For example, an alternative interpretation might include a fifth process type. However, there is another more radical way of expanding the taxonomy by recombining semantic types that are taxonomically distinct. This happens through the strategy of metaphor. One type is semanticized (conceptualized) as if it were another type. For example, in the final analysis, anything can be semanticized, and hence grammaticalized as if it were a thing. We find qualities as things and processes as things; i.e. nominalizations grammatically speaking: *creation, destruction, protection, grammaticalization,* etc..[28]

2.3.6 Conclusion: types of phenomena

As a summary of the discussion of the different types of phenomena, let me illustrate how the taxonomies interact. I have concentrated on three ranks of phenomena -- sequences, process configurations, and simple phenomena. In the unmarked case, sequences are composed of process configurations and process configurations are composed of simple phenomena. The 'roles' of a particular subtype are value restricted in terms of some class of the rank next below. For instance, one type of sequence is the projecting sequence. It has two roles, Projector and Projected. The first is value restricted to be filled by a process configuration of a mental type, whereas the latter is restricted to be a configuration that is an idea. Similarly, a mental configuration has (at least) two roles, Senser and Process, and the former is restricted to be a simple phenomenon of the type conscious being. The situation is diagrammed below.

[28] But we do not find things as processes; a verbalization does not entail a metaphor as a nominalization does (see Hopper & Thompson, 1984). Nouns turned into verbs typically denote a general process plus a specification of the class of one of its circumstances, e.g. *bottle* 'put ... into a bottle', *ship* 'send by ship', *finger* 'to touch etc. ... with fingers', and so on (cf. Quirk et al).

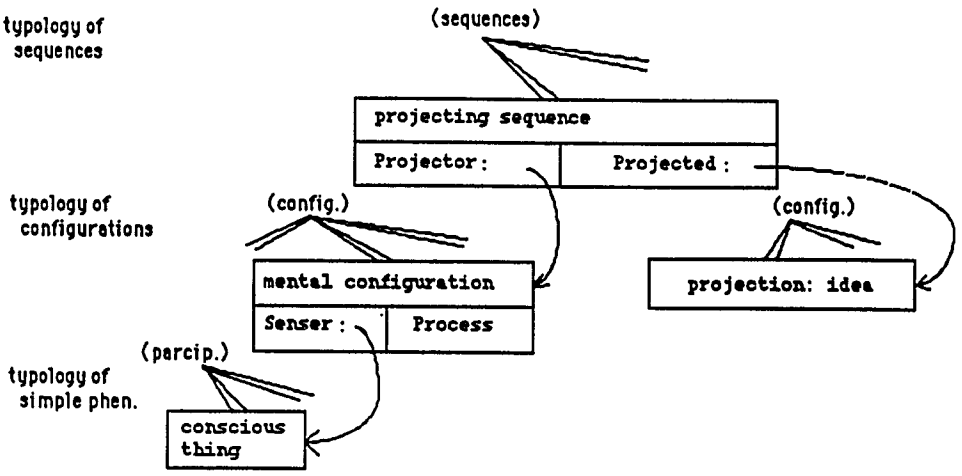


Fig. IV:2-29: The 'mental thread': successive value restrictions

2.4 Beyond the ideation base: metafunction and types of representation

I suggested above that the environment can be organized into an ideation base, an interaction base, and a text base: one of the fundamental lessons for knowledge representation is that meaning is metafunctionally differentiated and that each metafunction generates its own kind of representation. In fact, we might explore a **functional knowledge representation**, designed to organize 'knowledge' along functional principles and to differentiate types of

representation according to metafunction.[29] This exploration falls outside the present scope; I will just make a few brief observations.

Current knowledge representation in computational linguistics is a constraining technique for text generation because of its limited representational capability: a number of kinds of 'knowledge' are difficult to represent in a semantic net, including negation, modality (permission, possibility, probability, etc.), attitude, time and change, and sets and collectives.

As already mentioned, a concept frame in a semantic net is an experiential kind of organization; it is a multivariate configuration of parts. The possibility of extending the experiential model into other areas can be explored. In particular, a speech function can be represented as if it were an experiential process, which is how it is represented in English (the grammar of verbal processes) -- on the model of a configuration of saying (as happened in generative semantics, but in terms of syntactic constituency structure). A speech configuration would have roles such as the following, diagrammed below.

[29] In the area of logic, Dik (1987) argues that his Functional Grammar can be used to help design a functional logic.

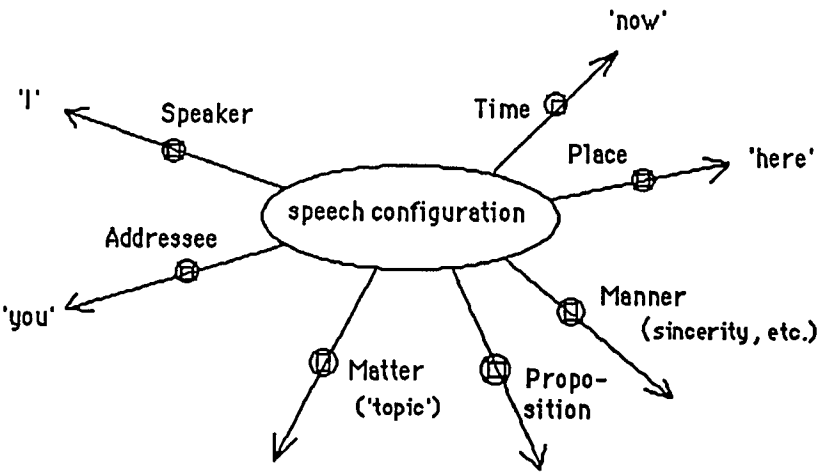


Fig. IV:2-30: Roles associated with speech configuration

These roles can be used to record information needed to support various grammatical resources; in particular:

the speaker and addressee roles determine PERSON choices;

the role for the place of the event of speaking determines the frame of reference for DEIXIS -- distinctions such as *here* vs. *there,* just as the time role does for *now* vs. *the;*

the time role supports the need for identifying the time of speaking in choosing TENSE;

the manner role supports interpersonal COMMENTS (e.g., *honestly, it's no trouble at all*);

the matter role supports INTERNAL MATTER (e.g., *as for Jenkins, he can do what he wants*); and

the proposition role supports the proposition (or proposal) itself.

The basic problem with this experiential model is that it does not capture the interactive nature of a move in an exchange and it leaves polarity, modality, attitude, and other interpersonal meanings unaccounted for.

The experiential concept frame is only one of the four kinds of organization possible for environmental information, viz. prosodic (interpersonal), dynamic (textual), and interdependency chain or sequence (logical). Given this observation, we can predict that existing knowledge representation techniques will have difficulties with the organization of information in the bases of the environment when this information is not experientially organized, i.e. with logical, interpersonal, and textual information. This prediction is borne out when we consider lists of types of knowledge that are difficult to represent (see e.g. the list given in Mann et al, 1981). There are difficulties with logical organization within the ideation base and with the representation of information in general in the interaction base and the text base:

base in the environment	representational problem
ideation base:	logical organization: sequences of various kinds, e.g. causal and temporal sequences; models of serial time.
interaction base:	negation (i.e. negative polarity) modality attitude key
text base:	theme-rheme given-new determination (including non-specific determination such as*some*, *every*, and other so-called quantifiers)

(This does not exhaust the list of representational problems, since the list also includes topics like change and sets.) One way of representing non-experiential information is through the use of Hendrix's (e.g., 1978) notion of network partitioning, which is a way of extending the representational possibilities in the use of semantic networks:

> To add a new dimension to the organizational and expressive power of semantic networks, the basic concept of a network as a collection of nodes and arcs may be extended to include the notion of partitioning ... The central idea of partitioning is to allow groups of nodes and arcs to be bundled together into units. Each such bundle is defined by new network space called a "space". Spaces are fundamental entities in partitioned networks, on the same level as nodes and arcs. ... A primary reason for developing the concept of network partitioning was to provide an efficient and uniform mechanism for dealing with higher-order logical constructs.

Hendrix gives examples of how partitioning can be used to represent quantification, logical connectives, negation, and questions. In addition Grosz (1978: 271 ff) shows how partitioning can be used represent focus spaces (to be discussed in Section IV:3). It is important to note that all these exemplify non-experiential meanings:

base	use of partitioning, example
ideation base, logical information	logical connectives
interaction base	questions negation
text base	focus spaces quantification

Given the nature of the logical, interpersonal, and textual mode of organization discussed in Section II:3.2, it makes very good intuitive sense that

logical, interpersonal, and textual information should be represented by a secondary mechanism such as partitioning rather than by the semantic network itself. The interpersonal mode of organization, the prosody, is represented by partioning the part of the network to which it applies: partitioning is used to 'colour' the network interpersonally. The textual mode of organization is 'second order'; it operates in terms of the organization created experientially. Partitioning reflects this second-order nature. One consequence of this functional view is that partitioning is a general mechanism that may be used in functionally different ways.

If partitioning is used in the way just hinted at, the interaction base and the text base will be modelled partly in terms of the ideation base. The information they contain will be represened as perspectives on the ideation base.

I will return to some of non-experiential types of information later in the discussion of the second base I will explore here, the text base, to which I will now turn.

3. The text base

The textual world view is ever-changing; it changes as the text and its context evolve: what was new becomes old, what was rhematic becomes thematic, was non-identifiable becomes identifiable, and so on. The development of text has been characterized in terms of movement and flow. By nature, the textual metafunction is dynamic rather than static like the experiential one: it is concerned with the ongoing presentation of the text. (A 'rose' is a 'rose', but 'it' is not necessarily 'it'!) For example, from a textual point of view, objects are instantiated referents, not classes in an experiential taxonomy (cf. Section IV:2.3.4.2.1 (3) above).

3.1 Overview of textual resources and text base support

The textual metafunction demands information about a number of distinctions, in particular thematic vs. non-thematic (THEMATIZATION), given vs. new (INFORMATION), and identifiable vs. non-identifiable (DETERMINATION), but these are not part of elaborate taxonomies of textual distinctions. Thus, the textual function contrasts with the experiential one, which organizes the elaborate taxonomy of processes. Although CONJUNCTION draws on an elaborate taxonomy of rhetorical relations, these relations are not unique to the textual metafunction but can be coded experientially as well. What the textual metafunction requires of the text base are procedures for managing the presentation of information as identifiable or non-identifiable, and so on.

There is a related difference between the experiential metafunction and the textual one. The experiential distinctions concern general classes of experience, such as thing vs. process or doing configuration vs. sensing configuration. In contrast, the textual *distinctions are specific to the text in its context* and their values vary as a text unfolds and the context changes.[1] For example, the textual notion of "identifiable" means 'identifiable at the current point in the text to the addressee of the text'. And the distinction between near and not near (e.g. *this / that* used to specify how a referent is identifiable) is deictic. Distinctions like these require a dynamic model.

3.1.1 Textual resources

The textual resources of the lexicogrammar were identified in Section II:2.1 and the properties of some of these were discussed in Section II:3.2.6. They include cohesive resources (ELLIPSIS & SUBSTITUTION, REFERENCE, LEXICAL COHESION, and CONJUNCTION) as well as resources that create grammatical structure (THEME, VOICE, and CULMINATION within the clause; and INFORMATION within the information unit).

3.1.2 Text base support: plans and planning

The central question now is what kinds of demands these resources make on the text base and how these demands can be met. I will address this question in two ways. First I will sketch the local plans for textual information that the

[1] This is not to deny that instantial experiential meanings can be developed in the course of a text; see Hasan, Ch. 5, in Halliday & Hasan (1985) and Fries (1982).

grammar has to be able to consult. Specifying what these plans have to contain is largely a matter of reviewing the inquiries of the choosers of the textual systems of the grammar. Next I will also say something about the harder problem, which is the question of how the text base can produce these local plans.

3.1.2.1 The local plans

Local plans are needed for grammatical units to support the inquiries from the various textual resources; I will focus on plans for clauses and for nominal groups. In talking about these plans, I'm not claiming that they must necessarily be fully specified when the grammar starts developing a clause or a nominal group; rather, the plan represents a *record of the kind of information that is needed* and it may quite conceivably be fleshed out as the demand for information arises.

(i) clause plans

The textual resources of the clause include CONJUNCTION, THEME, INTERNAL MATTER, VOICE, and CULMINATION. They need the following kind of information from the textual clause plan. Each will be discussed in more detail in the subsequent sections.

CONJUNCTION (Section IV:3.2) needs a specification of a ***conjunctive relation*** to prior text to be expressed (if any); there may even be a specification of two relations.

THEME (Section IV:3.3) needs a specification of ***contextualization,*** i.e. a plan of how to contextualize the clause (in relation to what happened up to that point in the discourse). More specifically, the contextualization breaks down into three components: textual - conjunctive (contextualization according to how the clause is related conjunctively to prior text), interpersonal -modal, etc. (contextualization according to how the clause is evaluated modally, attitudinally, etc.), and experiential - participant / circumstantial (contextualization according to some aspect of the process configuration).

INTERNAL MATTER (Section IV:3.3; *as for, as to, regarding,* & c.) is also a thematic resource and is similarly concerned with ***contextualization,*** more specifically a topic related to preceding topics, typically a 're-entered' topic.

VOICE (Section IV:3.4) is again thematic (in its textual contribution) and is thus concerned with ***contextualization.*** More specifically, it needs information about the identity of the current (participant) topic.

CULMINATION (Section IV:3.5) is concerned with ***news,*** specifically the relative newsworthiness of non-thematic participants and circumstances.

The fields in the textual plan that these resources relate to are summarized in the table below. I have also noted the kind of support needed in the text base to produce the plan specification to be discussed and exemplified.

TEXTUAL RESOURCE	FIELD IN PLAN	KIND OF SUPPORT NEEDED
CONJUNCTION	conjunctive relation (to prior text):	RST relation + added delicacy (e.g subtype of circumstance relation); also: other rhetorical moves (e.g. return to topic, dismissal of point)
THEME	context: textual-conjunctive interpersonal-modal (etc.) experiential - circumstantial & participant	continuity & shift in local context, relying on method of development, which correlates (partly) with the point of a rhetorical relation
INTERNAL MATTER	context: 're-entered' topic	as above; specifically, subsequent point of elaboration
VOICE	current (participant-) topic	'paragraph' topic and more local antecedent topic needed to compute relative topicality of candidate participants
CULMINATION	news: relative newsworthiness of non-thematic participants and circumstances	principle for selecting information (including anticipation of what will become topical)
nb: ellipsis/substitution, theme-pred, theme-identification		

In a speech generation system, it will also be necessary to create plans for information units, alongside those for clauses. These plans will have to rely on a strategy for determining how much information a unit of information should span and what is to be presented as news within one unit of information.

(ii) nominal group plans

The textual resources of the nominal group include DETERMINATION and related pronominal resources and SUBSTITUTION/ELLIPSIS. DETERMINATION needs information concerning the ***identifiability*** of the current referent. If it isn't recoverable for the listener, the plan has to specify how the current referent is to be selected from the set of potential referents. This will be discussed in Section IV:3.6.

3.1.2.2 The text base resources producing the plans

How can the text base produce these local plans for clauses and nominal groups; to what extent do they rely on the same abstractions and on text plans developed more globally (for the whole text or sizable spans of it)? As a way of getting started, I will begin with the following simple approximation. To create the local plans, the text base will need two kinds of abstractions:

(i) It will need a model of how the text is developed by ***relating spans of text*** rhetorically and

(ii) it will need a model of different ***textual statuses*** (as context, as identifiable, as news, etc.) within these messages.

The two are clearly related: the relationship to what precedes affects the textual status of what follows and the need to manipulate textual statuses affects the way in which relations are built up.

The question is now what frameworks are available two help us explore these models. In the case of the ideational resources of the grammar, there is an existing 'technology' for representing the information to appeal to -- the various forms of knowledge representation; there has already been a fair amount of research devoted to the problem of representing 'knowledge'. When we design the ideation base, we can draw on this work. There is no comparable body of work on the technology of representing textual information. However, there have been some explorations in two areas in computational linguistics:

(i) **rhetorical structure**: the relational structure of a text, identifying the relations by which one span of text can be related to another rhetorically, thus developing the text -- Rhetorical Structure Theory being developed within the Penman project for text generation, mentioned in Section I:3.2 and Section III:6; and

(ii) **focus spaces**: contexts of topical continuity that succeed one another in the development of a text, with the possibility of interruptions and dependendies -- in the work of Grosz, Sidner, and Reichman; e.g., Grosz's (1978) notions of focus, focus spaces, and focus shift (cf. McKeown's use of this in her TEXT system, mentioned in Section I:2.2) and cf. Grimes' (1982) linguistic interpretation of this work in terms of context spaces, a development of his earlier notion (Grimes, 1975) of staging. As already noted in Section IV:2.4, focus spaces have been represented as partitions of semantic networks.

The second notion needs extending to cover what is often called *information flow* in the development of text: we have to take account of a variety of *textual*

statuses -- thematicity, identifiability, newsworthiness, etc.. Focus covers just one aspect of this.

Let me start by introducing those aspects of Rhetorical Structure Theory needed in the subsequent discussion.

(i) Rhetorical Structure Theory (RST) is an approach to the study of text organization that is being developed within the Penman project (cf. Section I:3.2). It gives us the resources for describing a text in terms of its rhetorical structure. A text is interpreted as being structured by relations, so-called rhetorical relations: two spans of text enter into a rhetorical relation such as elaboration, cause, circumstance, or motivation. The relation is (typically) asymmetric; one of the spans is nuclear and the other has a satellite status. The difference between the two spans, the nucleus and the satellite, is a matter of centrality or nuclearity; related notions have been used in tagmemic work and work influenced by tagmemics, e.g. hypotaxis (Grimes, 1975) and nucleus-margin (Pike & Pike, e.g. 1982). The relational mode of structure contrasts with the constituency mode of structure most commonly used in linguistics; it is closer to the logical mode of interdependency structure discussed in Section II:3.2.4.[2]

A rhetorical relation is characterized in terms of (i) the conditions on its use (what Mann & Thompson, 1987, call constraints) and (ii) its intended effect.

(i) The conditions may apply to either text span entering into the relation or to the combination of them. They identify the conditions under which the rhetorical

[2] Extending the analogy, we can note that hypotaxis corresponds to nucleus-satellite relations and parataxis corresponds to multi-nuclear relations (see Matthiessen and Thompson, 1987).

relation is applicable. For example, a relation of motivation is only applicable if the listener is not motivated to comply with the request or accept the offer given in the nuclear span of text.

(ii) The effect identifies the function of a rhetorical relation in terms of the intended end-result -- the intended effect on the listener. For instance, the relation motivate relates a motivational satellite to a nucleus and its (intended) effect is to increase the listener's willingness to comply or accept. It is important to note that rhetorical relations are characterized in contextual terms, more specifically in terms of the listener's mental states, rather than in lexicogrammatical terms: a text is not seen as a concatenation of sentences.[3]

Each span of text entering into a rhetorical relation may in turn be organized into spans related rhetorically; i.e., there may be, and typically is, internal nesting. This provision for internal nesting can give the structure of considerable depth. We can see this as the hierarchic organization of text, but it is important to keep in mind that this 'hierarchy' created by internal nesting is very different from the hierarchy of rank-based constituency.

In addition to the nucleus-satellite type of relations mentioned above, RST also identifies multi-nuclear relations such as contrast. As an example of an RST structure, we can consider the analysis of the following grade school report on bats, taken from Martin & Rothery (1981).

[1] The bat is a nocturnal animal. [2] It lives in the dark. [3] there are long nosed bats and mouse eared bats also lettuce winged bats. [4] Bats hunt at night [5]

[3] RST is not a theory of conjunction, which has consequences when we ask how to support CONJUNCTION by means of RST; see below.

they sleep in the day [6] and are very shy.

The RST analysis of the bats report is given below. Text spans [4-6] and [3] elaborate text span [1-2]. Internally, [4-6] is organized in terms of joints and [1] is related to [2] by restatement.

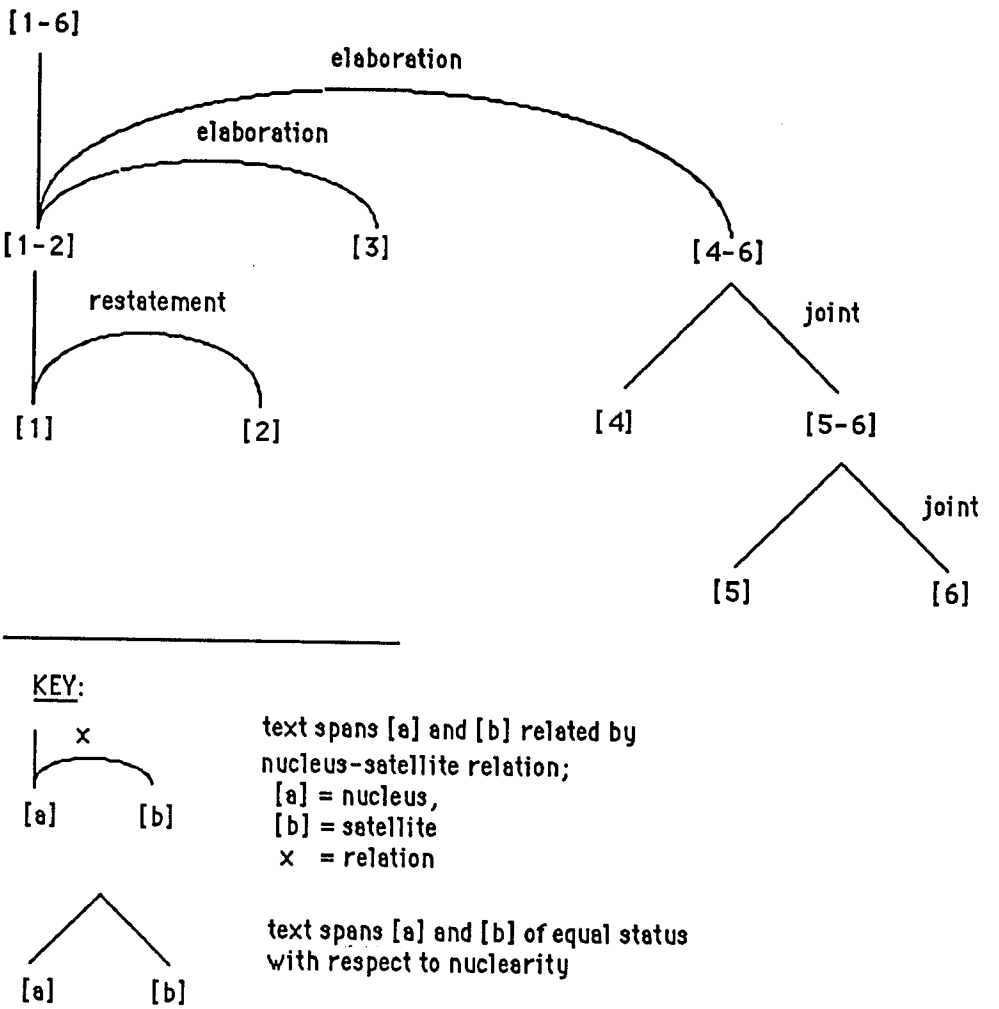


Fig. IV:3-1: RST analysis of bats report

(ii) Textual statuses and information flow. Taking the notion of information flow seriously, we can explore the possibility of modelling the flow by a means of a series of 'snapshots' or informational states that correspond to different kinds of textual statuses. The flow is then represented by the movement or shift from one of these states to another. The first question is how to represent one of the inormational states. I noted in Section IV:2.4 that a conceptual network can be partitioned into spaces to represent various types of non-experiential information. Partitioning can also be used to represent textual statuses. We can see this as a reflection of the second-order nature of the textual metafunction. That is, one way of representing one aspect of the text base is to do this in terms of the ideation base by partioning it, as in the case of a textual status and 'quantification'.

Textual status can be seen as the general notion of which focus is one subtype.[4] Grosz (1978: 230, 233) characterizes focus in task oriented dialogues as follows

> A focus representation is developed that highlights those items in the knowledge base ... that are relevant at a given point in a dialog and included mechanisms for changing focus as the dialog progresses. ... The most crucial requisite of a focus representation is that it differentiate among the items in the knowledge base on the basis of relevance. By highlighting those items that are relevant to the current discourse, the focus representation enables the system to access more important information first during its retrieval and deduction operations. The representation of focus presented here is base on segmenting the knowledge base into subunits. Each subunit, called a focus space, contains those items that are in focus of attention of the dialog participants during a particular part of the dialog. This segmentation is structured by ordering the spaces in a hierarchy that corresponds to the structure of the dialog.

[4] It has long been emphasized that it is necessary to separate various kinds of textual meanings such as theme and information; see Halliday (1967/8) and Fries (1981), who contrasts Halliday's account with treatments that have failed to distinguish these meaning; cf. also Grimes (1975: 273) on this point.

Grosz & Sidner (1986) generalize from task oriented dialogues to discourse in general. They characterize focus in terms of one of three aspects of discourse structure. These three aspects are linguistic structure (the organization of the discourse into discourse segments), intentional structure (the purposes that organize the discourse), and attentional state. The third is concerned with focus:

> The third component of discourse structure, the attentional state, is an abstraction of the participants' focus of attention as their discourse unfolds. The attentional state is a property of the discourse itself, not the discourse participants. It is inherently dynamic, recording the objects, properties, and relations that are salient at each point in the discourse. The attentional state is modeled by a set of **focus spaces**; changes in attentional state are modeled by a set of transition rules that specify the condtions for adding and deleting spaces. We call the collection of focus spaces available at any one time the **focusing structure** and the process of manipulating spaces **focusing**.

The relative salience of entities in focus spaces and the shift from one focus space to another during the development of the discourse are modelled by a stack of focus spaces. As the discourse develops, focus shifts can be represented by pushes onto and pops from this focus stack.

Grosz and Sidner's account provides a good deal of more detail and sophistication. I won't discuss it further here: the general point for present purposes is that we can think informally of textual statuses as being represented by partitions of the ideation base. These partitions can then be stacked and the 'flow' of textual information is modelled as operations on these stacks.

(iii) The relationship between RST and textual statuses. One central question is how the information flow just discussed is effected in the

development of a text: what leads to a change from one informational state to another? One can attempt to provide answers in terms of various abstractions such as paragraph structuring, goal (purpose) structure, and rhetorical structure.[5] Throughout discussion, I will explore the extent to which RST lends support to and organizes informational changes in textual statuses. There have already been some direct and indirect indications that RST is relevant in this context. Basically, an RST analysis specifies the relations that organize the text; but at the same time it also indicates a partitioning of the text (and by implication, its context) into spaces such as the two distinct ones providing elaborations. This aspect is of interest in the consideration of how the RST structure provides a way of organizing the contexts in which textual statuses and the strategies for presenting them are determined; for example:

THEME: Fries (1981) shows how themes may be used to bring out the method of development of a text; I will suggest that 'method of development' correlates with rhetorical organization.

INFORMATION: Fries (1988) illustrates how the culminative element of a clause may be chosen to relate to the purpose or point of a particular span of the rhetorical structure of a text.

REFERENCE: Fox (1988) points to correlations between the choice between a pronoun and a nominal group with a lexical noun as head and the

[5] Grosz and Sidner (1986) outline an account according to which focusing structure is "parastic upon intentional structure, in the sense that the relationships among [discourse segment purposes] determine pushes and pops" onto and from the focus stack mentioned earlier. It would take too much space to review their account and how it might relate to RST and other relevant work. In any case, they do not try to account for the range of textual resources discussed here but concentrate on the interaction between their model and a much less differentiated category of "cue words".

rhetorical organization of expository texts.

I will note the specific needs without specifying the details of the model or giving a unified account. We have a number of suggestive fragments of a general account, but a good deal of empirical work is needed.

I will start with CONJUNCTION since it gives us the most direct indication of what kind of rhetorical structuring the text base must be able to handle. Other textual resources, such as THEME (including INTERNAL MATTER), VOICE, CULMINATION, and DETERMINATION are also supported by this text structuring, but less directly; they are primarily concerned with information flow and textual statuses. These textual statuses include thematicity (contextualization), current topicality, newsworthiness, and identifiablity.

3.2 The CONJUNCTION resources

The resources of CONJUNCTION are used to mark conjunctive relations in a text -- elaboration, addition, alternation, contrast, temporal sequence, simultaneity, reason, and so on: see Halliday and Hasan (1976) and Martin (1983). For example, alternation is often marked in recipes:

> Fry some onions, mushrooms and sweet peppers in butter. Stir in some cooked macaroni and a chopped hard-boiled egg for each person. Moisten well with cheese, tomato or herb sauce and finish as for macaroni cheese. *Alternatively,* the macaroni may be served without the sauce, sprinkled with cheese only.

What does CONJUNCTION tell us about the text base of a generation system? CONJUNCTION needs the support of an account of *the structuring of the text by means of conjunctive relations.*[6] This means giving the generator some kind of rhetorical resource. That is, by looking at the resources of CONJUNCTION, we can identify a number of characteristics that the text organizing component of the text base must have to support the generation of conjunctively related clauses and clause complexes, support the generation of clause complexes, and other metaphorical codings of conjunctive relations (see Section II: 3.3).

As a first approximation, we can say that the resources of CONJUNCTION are used to ***code the rhetorical relations of the RST plan*** for the text. The support provided by this plan is illustrated by the following text (RST analysis by Peter Fries; rhetorical relations are marked by <-relation name->, together with indications of the scopes of the spans related).

> [1] Utilization of Mineral Salts. [2] A clear distinction should be drawn between the absorption of a salt and the subsequent utilization of it or its component ions. **[[2]<-BACKGROUND->[3]]** [3] The term utilization is employed in a loose sense for the incorporation of mineral elements into the relatively permanent constituents of the cell walls and protoplasm or for their participation in fundamental metabolic reactions. **[[2]<-ELABORATION->[4-7]]** [4] Absorption of the ions does not necessarily mean that they will be utilized. [5] Many of the ions absorbed by a plan remain for more or less indefinite periods in the ionic state in the cells. **[[5]<-SEQUENCE->[6]]** [6] *Sooner or later* many of these ions are usually incorporated either into the structure or more complex but assimilated molecules synthesized by the plant such as storage proteins, calcium oxalate, glycosides, etc., or into the protoplasm or cell walls.

[6] There is no general account for text generators. There have been accounts of specific relations in past generation systems. For example, Davey's Proteus system looked for and expressed contrast between actual and possible moves in the game commentaries generated (Davey, 1978).

[[5-6]<-EVIDENCE->[7]] [7] There may, *therefore*, be a considerable time lag between the absorption of an ion and its utilization, while some of the absorbed ions may remain indefinitely as such within the cells. **[[2]<-ELABORATION->[8]]** [8] *Furthermore*, some mineral elements may be utilized in one organ of a plan, subsequently released by disintegration of cell constituents, translocated to other organs of the plants, and there re-utilized. **[[2]<-ELABORATION->[9]]** [9] Redistribution of minerals which have accumulated in cells but have not actually been utilized is *also* of common occurrence in plants (Chapter 17). (B.S. Meyer et al., Introduction to Plant Physiology, London, Van Nostrand, 1960)

For instance, the SEQUENCE relation between [5] and [6] is marked by *sooner or later* and the EVIDENCE relation between [5-6] and [7] is marked by *therefore.*

We can see, then, that the resources of CONJUNCTION can be supported by the rhetorical plan for the text. I will comment briefly on how the conjunction of a clause may relate to this plan and where additional information is needed to support CONJUNCTION over and above what is provided by the current version of RST. Whenever there are discrepancies between conjuntive relations and RST, it is important to remember that RST is not intended to be a theory of conjunction.[7]

(1) Nesting and clusters

A conjunction may relate two simple messages, as in

Leave to set, *then* fry in deep fat or oil until a golden brown

[7] The discrepancies are thus only shortcomings of RST if it is held that RST should be more responsive to conjunctive relations.

but it may also relate a message to a sequence:

> Pour on to the hot butter and cook gently until the bottom is set and light brown. *Then* either place in a warm oven at 300-350° F., M2-4, until the omelette is set, or place under medium grill and cook until the top is nicely browned.

The conjunction *then* relates 'until the bottom is set and light brown' to the alternative sequence of 'either place in a warm oven ... or place under medium grill and cook ...'. This observation takes us back to Section IV:2 and the organization of sequential phenomena; it also relates to the discussion of clause complexes in Section II:3.2. It suggests that we can think of texts as sequential phenomena at least in some respects. The text is diagrammed below as a sequence.

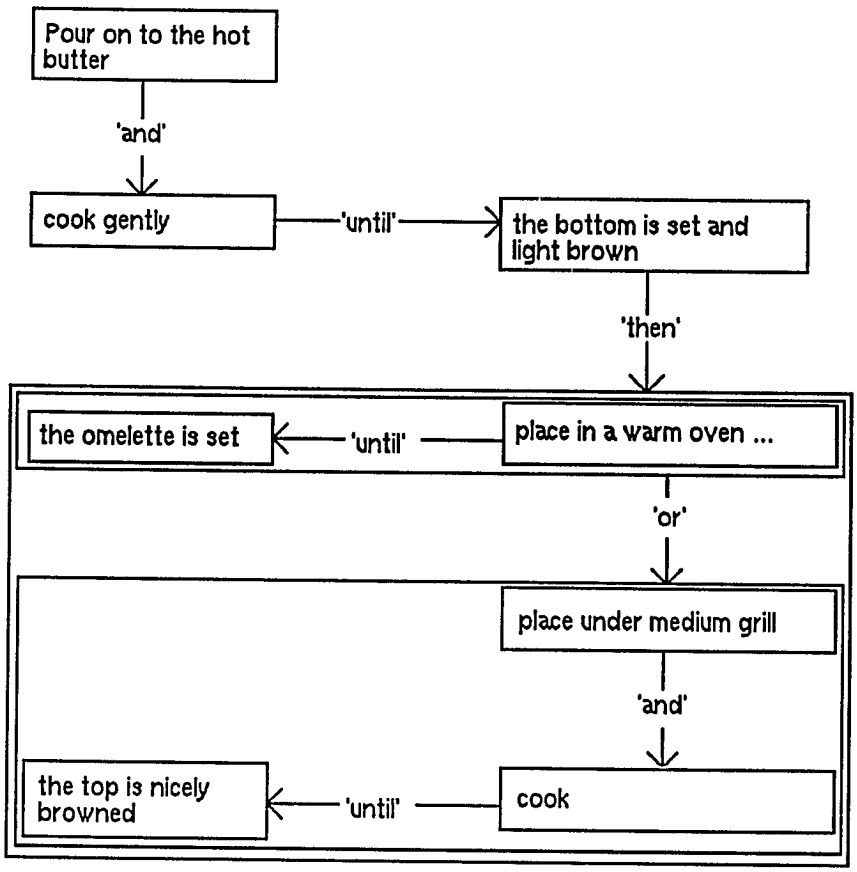


Fig. IV:3-2: Rhetorically related clusters

This text reflects a procedure from the ideation base, a kind of sequential phenomenon. Texts may also reflect interactional complexes -- e.g. complex arguments of various kinds.

In the example above, the clusters related by *then* are coextensive with clause complexes. However, conjunctively related clusters are often not. In particular, the rhetorical scope of a conjunction may extend beyond the clause in which it occurs. Consequently, the text base must be able to plan the

conjunctive relation for the first clause realizing the text span that enters into the rhetorical relation to be expressed. This situation is illustrated by the following text. Its rhetorical organization will be presented in detail later; here it is sufficient to recognize that units [3] and [4] exemplify unit [2] and that this relation is marked in unit [3].

> Program. [1] **Programs** issue instructions to the computer. [2] **Many programs** process files. [3.1a] <u>For example</u> **a message program** can, [3.1b] by following your commands, create and send a message [3.2] and manipulate a file of messages. [4.1a] **A text editing program** can follow commands [4b.1] to create a text file [4b.2] and edit it, [4.2a] while **a text formatting program** can follow commands [4.2b] to format text [4.2c.1] by centering a heading, [4.2c.2] enumerating a list, [4.2c.3] italicizing a name, etc. [5] **Programs** are stored as files on the System. (Moses)

The central point for specifying the conjunctive relation field of a textual clause plan is that it may reflect a rhetorical relation that is not local only to the current clause, but which may scope over a text span of which the current clause is only the first realization. Subsequent clause plans pertaining to the same span do not need to include a specification of the conjunctive relation if it has already been indicated in a previous clause.

(2) The types of conjunctive relation

As we have seen, a particular rhetorical relation can, in general, serve to support the resources of CONJUNCTION. However, there are three cases where additional information is needed:

(i) The rhetorical relation may not be specified to the degree of delicacy expressed by the conjunctive relation;

(ii) the rhetorical relation may be different from the conjunctive relation; and

(iii) the conjunctive relation may express a type of relation for which there is not corresponding rhetorical relation.

(i) Further delicacy needed. In a number of cases, a rhetorical relation spans a set of more delicately specified conjunctive relations. Consider, for example, the rhetorical relations of circumstance and sequence. The intended effect of the circumstance relation is that the reader should recognize "that the situation presented in [the satellite] provides the framework for interpreting [the nucleus]" (Mann & Thompson, 1987). The rhetorical relation of circumstance often corresponds to a temporal conjunctive relation; but the rhetorical relation does not provide the information needed to differentiate the more delicate subcategories of temporal conjunctive relations. For instance, it covers extent in time (*as, while*) as well as point in time (*when*):

> **As** your floppy drive writes or reads, (<-CIRCUMSTANCE->) a syncom diskette is working four ways to keep loose particles ...
>
> **When** he lost his crown in 1485, (<-CIRCUMSTANCE->) the heralds lost it all, ... (LAT, ST analysis)

The intended effect of sequence is that the reader should recognize "the succession of relationships among the nuclei" (op cit.). Sequential conjunctive relations may mark simple sequence (*then, next*), but in addition they may specify some other feature, which is not specified by the rhetorical relation of sequence; e.g.:

sequence, delay in succession: soon

sequence, immediate succession: immediately, at once

sequence, reversed order: previously

sequence, conclusive: finally, in the end

(ii) Different relation types, rhetorically and conjunctively. The rhetorical relation of condition, the intended effect of which is that the reader should recognize "how the realization of the situation presented in [the nucleus] depends on the realization of the situation presented in [the satellite], may correspond to a conditional conjunctive relation, in which case there is no problem; but it may also correspond to a temporal conjunctive relation. The latter case is exemplified by the following excerpts.

> If you are playing at the baseline (<-CONDITION->) shift immediately back toward the center of the court (<-CONDITION->) **after** you make a shot.(Tennis Tips, ST analysis)

> At the net, quickly get your racket back up in front of you (<-CONDITION->) **after** you hit a volley. (Tennis Tips, ST analysis)

> **When** ready to serve, (<-CONDITION->) you may toss the meat, including the ground liver and intestines in 6 tablespoons melted butter (<-CONDITION->) **until** heated. (Terrapin recipe, ST analysis)

The rhetorical relation of condition picks up on the *unrealized* character of the satellite, not on the temporal relation expressed conjunctively. (There is, of course, a connection between general time 'when' and condition, what Quirk et al. (1985: Section 15.30) call recurrent or habitual contingency.)

(iii) No corresponding rhetorical relation. CONJUNCTION points to a very general principle of text organization. Conjunctions are external or internal

(Halliday & Hasan, 1976); the two types are exemplified below (adapted from Halliday & Hasan).

(external:) Henry walked up to the entrance. First he switched on the light. Next he inserted the key into the lock.

(internal:) Henry was really out of it last night. First he was unable to stand upright. Next, he was incapable of inserting the key into the lock.

In the first example, *first* and *next* order two processes in our experience of an episode in Henry's life; the processes are external to the text. In the second example, *first* and *next* order two pieces of evidence in an argument; the sequence is internal to the argumentative text being developed.

The distinction between external and internal reflects the fact that text can be organized according to a sequence of processes from the ideation base, external to the text itself; or according to the activity of speaking that constitutes the text -- the interaction of the interaction base -- and is thus internal to it. External and internal development can be either used as alternative strategies or as accompanying strategies. For present purposes, the central point is that the text base must be able to draw on relations from the ideation base as well as relations from the interaction base in developing the text.

While there are a number of rhetorical relations of an internal type (in particular, those relating to the success of a rhetorical act: background, justification, motivation, evidence, and enablement), there are a number of internal relations without any obvious rhetorical relational correlates. This means that we have to account for more complex relations such as the following

internal relations

(i) addition with reinforcement: `again, furthermore, moreover,` etc.

(ii) dismissive relations (preceding circumstances are dismissed as irrelevant): `anyhow, at any rate,` etc.

(iii) resumptive relations: `to resume, to return,` etc.

(iv) verificative relations ('as against what the current state of the communication process would lead us to expect, the fact of the matter is ...'; Halliday & Hasan, 1976: 253): `actually, in fact,` etc.

(v) distractive relations (afterthought, as a way of de-emphasizing): `incidentally, by the way,` etc.

(vi) interpretive relations: `that is, I mean,` etc.

These relations indicate among other things that the rhetorical component must be able to leave one context, develop the text within a new context, and then return to the original context (the resumptive relations). In addition to the cases just illustrated, there are also continuatives (Halliday & Hasan, 1976: 268 ff). They are internal and may indicate for example a new stage in communication (*now*) or the status of a move as a response (in exchange structure: *well*).

~*~*~*~

In addition to the considerations mentioned so far, there is another important issue that needs exploring, viz. the question of under what conditions a conjunction is used to mark a rhetorical relation and when it is left implicit. I will not pursue this question here.

CONJUNCTION reflects the relational structural development of a text; at the same time, it reflects the ongoing contextualization of conjunctively related parts of the text. As contextualization, it is inherently 'anaphoric' (as can be seen from the use of reference items in certain conjunctions -- e.g., *as a result [of this]*); it relates to the preceding discourse. Theme sets up the local context of a clause; the context may be specified interpersonally, experientially, or textually. This contextualization may be anaphoric, in which case there is a close correspondence with the rhetorical development of a text; but it need not be. The textual context of a clause is its rhetorical relation to preceding text as specified by CONJUNCTION.

3.3 The THEMATIZATION resources

The selection of the Theme of a clause determines its local context. Theme has been glossed as 'starting point of the clause as message', 'context', 'frame', 'setting', 'orientation', and so on. (These glosses are not formal definitions, but are only intended as ways of thinking about the category of Theme.[8]) We can think of THEME as a resource for ***contextualizing*** the clause; it allows the speaker to manipulate the local context of the clause. In English, it is expressed

[8] Since a functional category has to be defined upwards (in stratal terms), the definition has to rely on a theory of the relevant higher-level domain. In the case of the ideational metafunction, it is probably generally felt that we can appeal to categories such as action, time, and space, but in the case of the textual metafunciton, there is no similar congruent frame of reference to fall back on. One way of getting started is to construct the domain metaphorically. In fact, textual characterizations are often spatial metaphors (e.g., 'in attention', 'information flow', 'guideposts' [presumably on a semiotic journey], and 'point of departure'), thus drawing on the ideational metafunction. We have to come to grips with 'the flow of information' in discourse processes. Once we have a theory of 'the flow of information' in the unfolding of text, we can relate the characterization of Theme to it. If we think of the dynamics of the unfolding text, the notion of starting point is helpful; if we focus on the way in which the listener integrates the information presented with what he or she already knows, notions such as frame or peg are helpful; they indicate where to integrate the information (cf. Reinhart, 1982, for the latter perspective).

by initial position in the clause; themes are textual, interpersonal, or experiential.

Experiential themes. Experiential themes are participants or circumstances in the transitivity structure of the clause. For instance, they may be temporal locations, as in the following example (Theme underlined):

> On March 27, as President Reagan departed for a working vacation at his secluded mountain-top ranch, he applauded the Senate's approval of a bill for $100 million to aid Contra forces in their struggle against the Managua government.
>
> A week previously, the House voted down the proposal for new aid to the Contras. Congressional opponents of the anti-Sandinista force contend the group is ineffective.
>
> (The Desert Sun, 5/iv/86)

In this extract, the Themes are non-default. They are times and they have been chosen to show the temporal organization of this span of text. The first orienting context is a date, *on March 27,* and the second relates to it conjunctively, changing the temporal context to a previous time. There is an important generalization to be made here: the contextualization provided by the theme selection may bring out the method of development and the method of development of the text is thus an important factor in theme selection.

(i) Contextualization based on the method of development

Fries (1981) has shown that Theme is selected to bring out the ***method of development*** of a span of text. We can state this as follows: the local context

of a clause specified thematically, the context in which the clause is to be understood, includes the way in which it develops the text. The process of contextualization is here, in a sense, 'anaphoric': the local context of the clause is set up in relation to the preceding discourse context. (We should not, however, equate the notion of contextualizing with the development of the text. As will be illustrated below, themes may provide contexts that do not reflect the method of development.) Themes are thus selected to guide the listener or reader through the text by indicating the method of development. Methods of development include organizations that are temporal (as in the example above), spatial, lists, general to specific, object to attributes, object to parts, and compare & contrast (cf. Danes, 1974).

Method of development and rhetorical organization. The question now is to whether the method of development is embodied in the rhetorical component of the text base or whether it has to be maintained and manipulated as an independent component. There is good evidence that ***the method of development is embodied in the rhetorical organization*** of the text as it is stated in terms of Rhetorical Structure Theory (Mann & Thompson, 1987a,b). This is true, of course, of conjunctions, which are natural theme candidates; but is also true of participants and circumstances when they specify ***the 'point' of a rhetorical relation*** -- the point of contrast, instrumental enablement, sequence, elaboration, and so on. This can be seen clearly with **sequence**, where the temporal specifications providing the points of sequence provide natural themes; for instance:

> The French revolution resulted in a major shake-up among the European powers *and* in 1796 the Dutch were easily supplanted by the British who also managed to subdue the kingdom of Kandy and became the first European power to

control the whole island. Until 1802 the British administered Sri Lanka from Madras in India *but* in that year it became a Crown Colony *and* in 1818, three years after the incorporation of Kandy, a unified administration for the entire island was set up. In 1832 sweeping changes in property laws opened the doors to British settlers - at the expense of the Sinhalese who did not have clear title to their land, in British eyes. *Soon* ... (Wheeler)

Similarly, the following span of text is organized rhetorically as a **contrast** and the themes (underlined) have been selected to identify the points of contrast.

[nucleus 1:] In his mind he is another "Carlos the Jackal," the international terrorist who has kidnapped, killed and still runs free. [nucleus 2:] *But* in reality Mehmet Ali Agca, the man who shot the pope, now lives isolated under close surveillance in Ascoli Piceno Prison outside Rome. (Newsweek, 20/vi/83)

There are two aspects to the contrast: one is the relation of contrast itself -- 'but'; the other is the pair of points of contrast within the contrasting messages -- 'mind' vs. 'reality'. There are thus two ways of marking the contrast, by marking the relation of contrast and by foregrounding the points of contrast; diagrammatically:

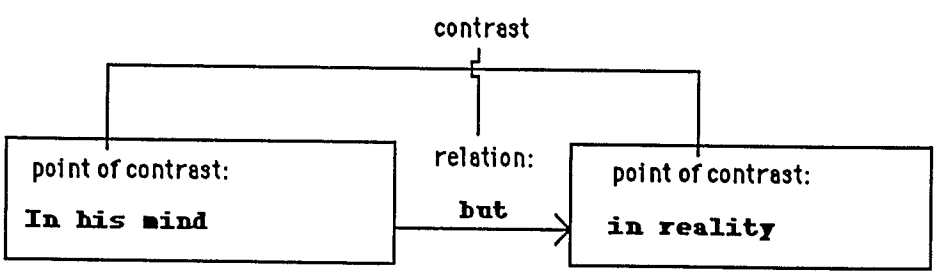


Fig. IV:3-3: THEME and CONJUNCTION bringing out contrast

In this example, Theme and Conjunction are simply two different aspects of the same rhetorical development of the text. Similarly, the following span of text is organized by means of two **elaborations** of a nuclear subspan and the themes have been selected to identify the points of elaboration.

> [nucleus:] Last month's devaluation of the peso created an absolute mess for businesses in both countries. [elaboration 1:] On the Mexican side, supermarket shelves were stripped clean of basic necessities by Americans who found their dollars worth three times as many pesos as they were a year ago. [elaboration 2:] On the American side, merchants whose lifeblood is Mexican patronage were left standing beside silent cash registers.

The themes are locative because the locations are the points of elaboration; but whatever serves as the point of elaboration may be thematic. In texts that define or describe an object, e.g. in entries in dictionaries and encyclopaedias, the organization is often centred around the object being defined or described. After it has been introduced, the class it is a subtype of is mentioned, its attributes are identified, and subparts are specified. The Theme is likely to be the object itself throughout the text; in descriptive texts, the Theme is often also the 'topic' or 'subject matter' of the description. Further, the Themes are likely to be default ones, i.e. they are likely to be Subjects.

For instance, consider the following 'entry' on the notion of program (already quoted above), taken from an introductory manual on an operating system:

> Program. [1] Programs issue instructions to the computer. [2] Many programs process files. [3.1a] *For example* a message program can, [3.1b] by following your commands, create and send a message [3.2] and manipulate a file of messages. [4.1a] A text editing program can follow commands

> [4b.1] to create a text file [4b.2] and edit it, [4.2a] while a text formatting program can follow commands [4.2b] to format text [4.2c.1] by centering a heading, [4.2c.2] enumerating a list, [4.2c.3] italicizing a name, etc. [5] Programs are stored as files on the System. (Moses)

The experiential themes throughout the text are concerned with 'programs', either the class itself, as in [1] and [5] or with subclasses, as in [2] through [4]. [2] introduces a subset of programs and units [3], [4.1] and [4.2] give examples of subclasses. Each theme indicates the point of the rhetorical development of the text, as can be seen from the following rhetorical analysis of it.

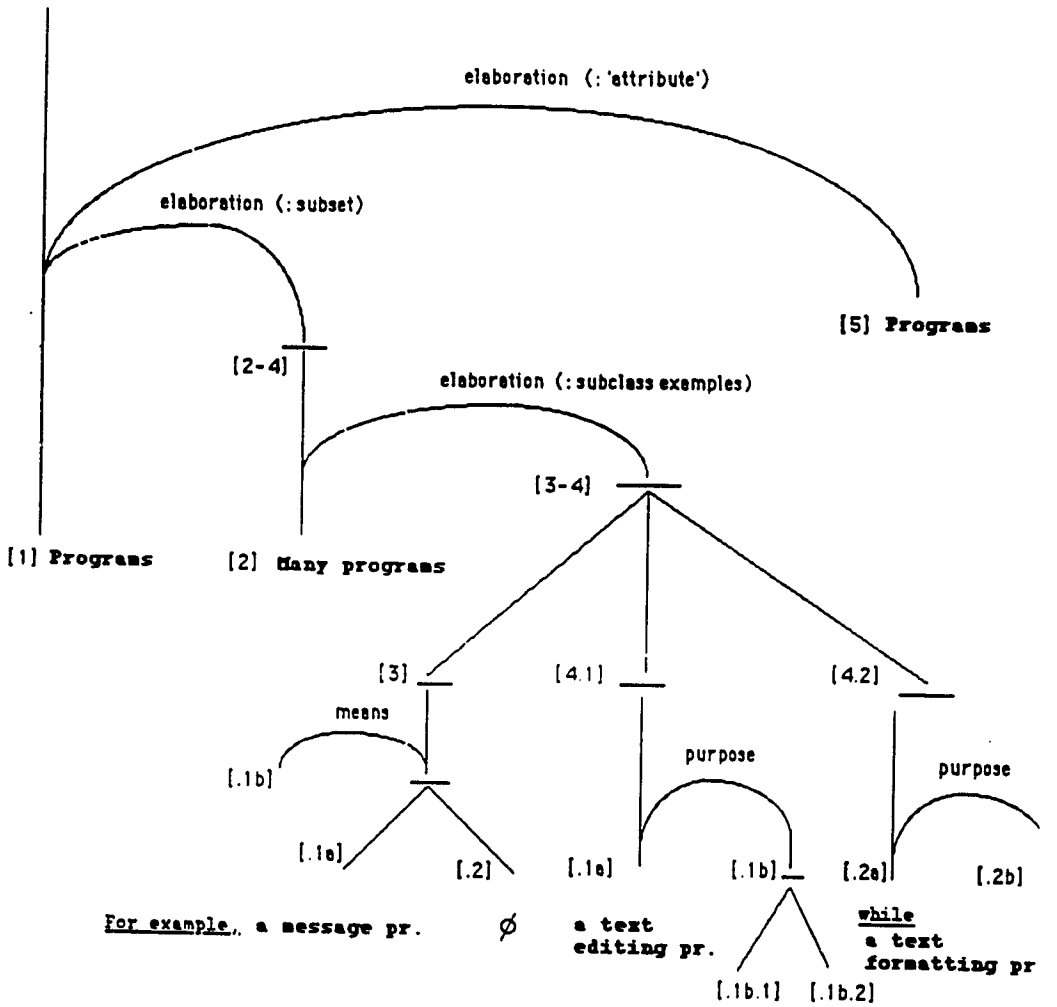


Fig. IV:3-4: Rhetorical organization and theme selection -- elaboration

Note that the conjunctive relation marked in [3.1a] scopes over [3] and [4] in the rhetorical analysis, although it is grammatically local. VOICE selections support the thematic organization: the selections are such that 'programs' or their subclasses occur as subjects, which are the unmarked themes throughout the text. A similar kind of example is given below:

> [nucleus:] A return to Latin nomenclature for graduation honors at UCLA has been approved by the Legislative Assembly ... [elaborations:] Summa Cum Laude designates graduates in the top 5 percent of their college. Magna Cum Laude designates the next 5 percent, and Cum Laude the next 10 percent.

McKeown's TEXT system generates texts that define objects and compare and contrast objects (McKeown 1985) and the Themes are also the Subjects of the clauses, the default choice.

(ii) Contextualization not based on method of development

The contextualization provided by Theme may involve factors other than the method of development. For instance, in instructional texts, the means used in a procedure is a natural thematic candidate, although this category seems to be rare as theme in texts in general (as compared to e.g. spatial and temporal themes). Thus, in the following example, the method of development is made explicit through the thematic conjunction (*meanwhile*), but in addition the instrument of mixing is set up as the context:[9]

[9] In cases such as this, the generic structure of the text may provide support for the thematic choices.

Reduce heat to simmer and cook for 25 minutes. Meanwhile, **with a blender or beater**, mix: [list of ingredients]. (Cadwallader)

Similarly:

When the fat is smoking hot, drop spoonfuls of the mixture into it and cook until brown. Then, **with a slice or palette-knife**, turn the fritter over and cook on the other side. (Highton & Highton)

~*~*~*~

INTERNAL MATTER. The resource of was introduced and exemplified in Section 3.2.6.3.1.1 (i). At that point, I was concerned with they way it is related to the experiential structure of the clause -- cohesively, typically by means of reference; not structurally -- but I didn't discuss specific contribution to the development of a text. It is quite similar to the thematic resources in general; it is a strategy for changing and specifying the referential context of a clause. The particular meaning seems to vary somewhat depending on the register.[10]

It is very common in expository text, where it seems to correlate very well with the rhetorical strategy of ***elaboration.*** If a nucleus introduces a number of discourse participants and these are then elaborated in successive satellites, the shift to the new referential context of the second or a later elaborating satellite may be marked by means of INTERNAL MATTER. For instance, in the following excerpt, a number of food items are introduced in the satellite and then picked up in the subsequent elaborating satellite. The second one is introduced by an Internal matter (*as for pickles;* the top layer of organization is

[10] This is in no way unique to INTERNAL MATTER, of course; it's a specific instance of what Halliday has observed about register and situation specific semantices (Halliday, 1973; cf. Section III:6).

indicated, internal organization is not):

> [nucleus:] Also served at the same time will be vegetables - parboiled or raw - pickles or chutneys and curd. [elaboration 1:] Chutneys are generally prepared with fruit or vegetables, vinegar and something closely resembling Worcestershire sauce. Two of the most delicious varieties are mint and mango chutney; but here again *there* will be as many varieties as there are "raw materials" and in as many different guises as the cook cares to dream up. [elaboration 2:] **As for pickles**, they can be made with fruits like mangoes, peaches or limes as well as the more familiar vegetables. [elaboration 3:] The curd has somewhat the same role to play as dhal, i.e. *it* is very soothing if *your curry* has made a particularly fiery descent. *You* may also find it on the menu as dahi. (Fodor's India, p. 150)

3.4 The VOICE resources

The THEME resources point to the need to keep track of and plan the local context of a clause in the text base. The VOICE resources also rely on this type of information, since Subject is thematic in the unmarked case (in a declarative clause); in particular, they have to be able to rely on the specification of the ***current topic*** in the clause plan. To determine the current topic and make appropriate voice choices accordingly, it is also necessary to keep track of the topic of the current paragraph, as Thompson (1987) shows, and of more local topics.

Since the default candidate for Theme in a declarative clause is its Subject, there is an important component of thematic reasoning in VOICE selection. The Subject is conflated with one of the participant functions in the transitivity structure of the clause; which one it is depends on the VOICE selection.

Consider the receptive ("passive") selection in the following excerpt from a short biographical note on a novelist (Farrell):

In 1966 he was awarded a two-year Harkness Scholarship.

From an experiential point of view, the clause is a material one; more specifically, it is of the benefactive subtype. This means that the VOICE options are as follows:

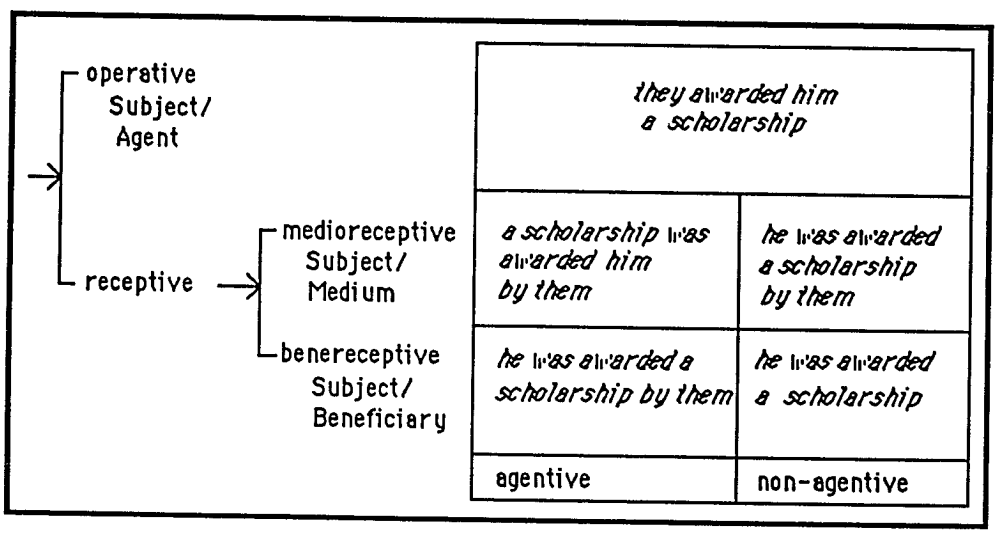


Fig. IV:3-5: VOICE options in a benefactive material clause

The basic choice is between operative ("active") and receptive ("passive"). In an operative clause, the Subject is the Agent and the verbal group realizing the Process is in the active. In a receptive clause, the verbal group is in the passive.

There are two further systems of options. One is the choice between a benefactive Subject (benereceptive) and a medium Subject (mediorecepive);

between Beneficiary as Subject and Medium as Subject. The other is the choice between specifying the Agent (agentive) and not specifying it (non-agentive). This second system is represented in the two columns in the table in the figure above.

I suggested above that the choice of VOICE is dependent on thematic reasoning. This is the factor of particular interest in the present context, but it is only one of four factors; there is another textual factor (the selection of unmarked news) and also interpersonal (the assignment of modal responsibility) and ideational ones (the specification of the Agent):

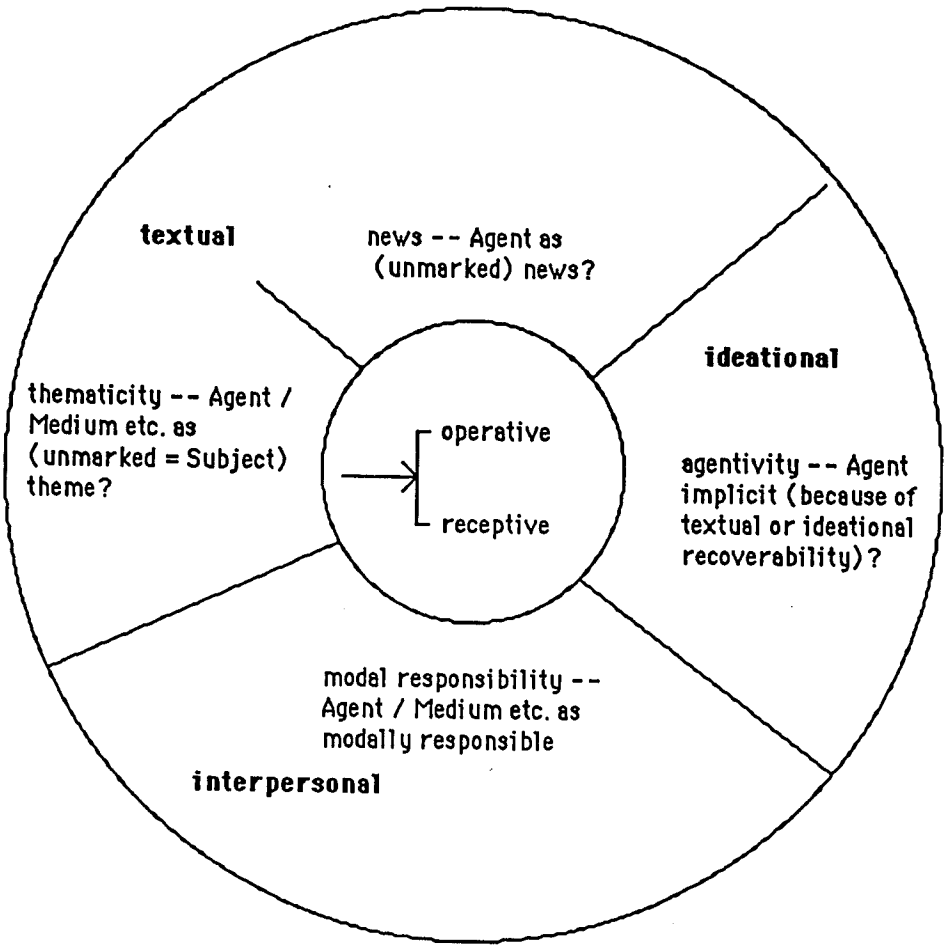


Fig. IV:3-6: Factors influencing the choice of VOICE

Let's consider these factors in the context of the example cited above. It is receptive, non-agentive, and benereceptive; the Subject is the Beneficiary and there is no Agent. We can posit the following influences on the VOICE selection:

textually: Beneficiary: Farrell (*he*) as topic; Medium: the scholarship as news (*a two-year Harkness Scholarship*);

interpersonally: Beneficiary: Farrell as modally responsible; and

ideationally: Agent without particular interest, of the general class participating as Agent in the process (those who award this type of scholarship).

These factors converge on the selection; there is no conflict to be resolved. The choice of receptive leads to the possibility of choosing non-agentive and the choice of this feature enables us to dispense with the Agent. It makes good sense in the present case, since there is no particular reason to be interested in who awarded the scholarship. The desire not to specify the Agent is often one of the reasons for choosing receptive over operative. This happens when the Agent is recoverable from the current context (textual recoverability) or when it is predictable in general terms from the nature of the process (ideational recoverability). In the present case, the Agent would be the people who award Harkness Scholarships.

There are two related reasons for choosing between benereceptive and medioreceptive. They can also be illustrated by reference to the present example. The topic (subject matter) of the biographical note is the novelist Farrell, the recipient of the scholarship, as can be seen from the following extract:

> J. G. Farrell was born in Liverpool in 1935 but __ spent much of his childhood in Ireland. After __ leaving Oxford he taught English in France for several years. In 1966 he was awarded a two-year Harkness Scholarship. ...

Farrell participates in the process of awarding as the Beneficiary, and the participant that is conceptually closest to the topic of the current paragraph (i.e., Farrell in the example) is typically made the Subject of the clause; see Thompson (1987). The Agent (the unnamed award givers) and the Medium (the scholarship) are related only indirectly to Farrell as the paragraph topic, through the process of awarding.

The second reason for making Farrell the Subject of the clause is that this makes him the protagonist of the statement expressed by it. This reflects the interpersonal meaning of Subject as 'modally responsible'; the validity of the statement depends on him as Subject (cf. Halliday, 1985). If we wanted to deny the validity of it, we would do it by reference to him: *He was awarded a two-year Harkness Scholarship. - No, he wasn't!* If he had refused, this could have been reported as: *he wouldn't* ('wasn't willing to') *be awarded a two-year Harkness Scholarship.*

If the Agent is non-specific, but the speaker wants to assign it modal responsibility, there is a strategy of using *they.* Thus we might have *They awarded him a two-year Harkness Scholarship,* at least in casual spoken English. Thompson (op cit.) discusses this strategy and includes the following examples (from Schegloff transcripts):

> Because they're building eh they -- when they bil -- they're building this new subdivision?
>
> No I have my early class tihday et four thi:rdy. Tch! Except that cla- That class is suh:: yihknow, this is the indian class 'n- *ohhh They stuck us in this cra:zy building thet they juh they're not even finished with it.

She finds in her data that this strategy is favoured over the (non-agentive) receptive "whenever the inferable but unimportant agent is 'those typically in charge of such activities'" (cf. Halliday and Hasan, 1976: 53). It is this notion of being in charge of that reflects the modal responsibility embodied in the selection of the Subject.

In the present context, it is the textual reasoning that is of particular concern. To handle the thematic reasoning just illustrated, there must be a facility for managing topic, both continuity in topic and topic shift; concerning this, cf. McKeown's (1985) use of focus in her TEXT system. One question is what the correspondence is between rhetorical spans specified in the rhetorical organization of a text and the notion of paragraph topic Thompson uses in her account. It is clear that shifts in 'paragraph topic' may accompany changes in the rhetorical organization. For instance:

> Control Key. [1] *The Control Key* is represented in this document by |. [2] *It* is used with another key to enter a command. [3] You may hold *the Control Key* down for as long as you want, but you should press the other key only once (the way you would use the Shift Key on a typewriter). (Moses)

The nuclear part of the text is unit [2], which specifies what the Control Key is. Unit [1] provides background by informing the reader how the key is represented. In these two units, the topic is the Control Key and the clauses realizing units [1] and [2] are receptive so that it can be the Subject and unmarked Theme. In unit [1], there is another candidate, the symbol representing the key; but it is less closely related to the topic and it is, moreover, the 'news' of unit [1]. Unit [3] elaborates units [1-2] and in doing so it shifts the topic from the Control Key to advice to the reader concerning its use. The reader

thus becomes a more likely subject candidate than the Control Key. (This is supported by the interpersonal consideration of modal responsibility: the one held responsible for pushing the key is the reader -- *you should.*) The RST analysis is given below.

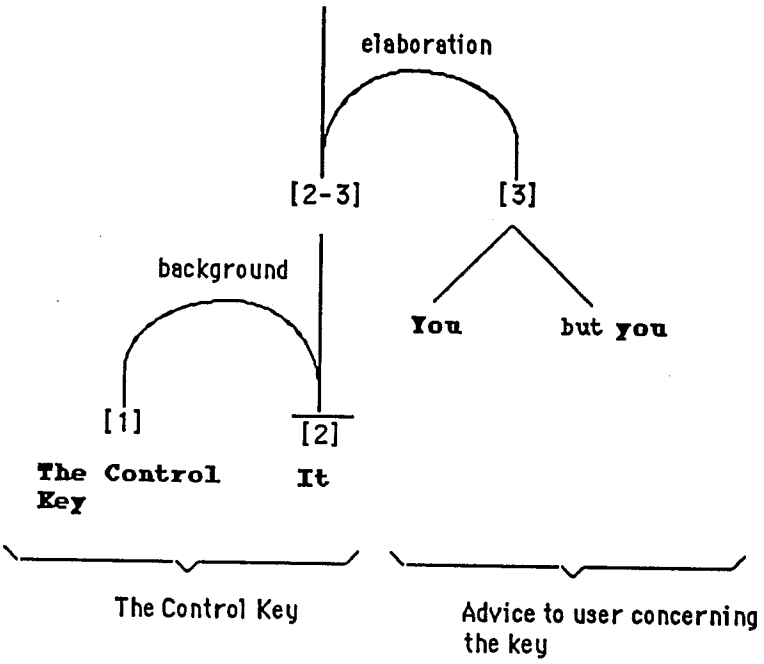


Fig. IV:3-7: Change in Theme and rhetorical spans

In the case of short literary biographies, it would seem that the same paragraph topic spans the entire text. However, the use of reference strategies (proper name vs. pronoun) points to additional paragraph decomposition of texts of this type; see Section IV:3.7 below.

It is also clear that we need to specify and keep track of local topics as well as the more global type of paragraph topic. VOICE selection in relative clauses is a case in point. The antecedent of the relative clause provides the local topic and receptive voice is typically chosen over operative if this is necessary to achieve a subject-relative, even if the clause is agentive:

> Among the many interpretations of the mathematical formalism of quantum theory is the causal interpretation "that was developed by David Bohm over a period of several decades, beginning in the early 1950s'. (Bohm & Peat, p. 87)

However, a non-relative participant may be the Subject in an operative clause if it is related to the global paragraph topic, as in the following example:

> Clearly, *modern scientific instruments* can no longer be regarded as simple extensions of the senses. Indeed, even the raw data "that *they* yield' are generally fed directly into computers in the form of numbers and digitized signals. (Bohm & Peat, p. 65)

Here the general topic is the scientific instruments and it over-rides the local topic provided by the antecedent of the relative clause. To develop an account for generation involving both paragraph topic and more local topics, we need to have more information on how they interact and how conflicts may be resolved.

3.5 INFORMATION; CULMINATION

The notion of Theme (opposed to Rheme) is distinct from the notion of New (opposed to Given); see Halliday (1967/8, 1985); and Fries (1983). The latter belongs to the functional region of INFORMATION, and operates within the information unit. It is realized by intonational prominence; its meaning is discussed in e.g. Halliday (1985: ch. 8); it can be glossed as "attend to this; this is news". It is a strategy for directing the listener's attention to the news of the current message. The text base thus has to have a theory of news to support the assignment of New.

Since New is realized by intonational prominence, it is a category of spoken English. However, in the default case, the intonational prominence comes at the end of the clause, so there is a default association between final position in the clause and New and this is manipulated in written English as a way of indicating unmarked news. CULMINATION is the choice of what element of clause structure should be given this status of unmarked news. The choice was exemplified and discussed in the context of representational issues and the textual metafunction (Section II:3.2.6).

3.6 The DETERMINATION resources

In the clause, THEMATIZATION determines the thematic status of participants and circumstances (thematic vs. rhematic). In the information unit in spoken English, INFORMATION determines their information status (given vs. new).

These textual statuses are independent of but clearly related to a third textual status, the identifiability status of referents; this status is controlled by DETERMINATION in the nominal group. Thematic status, given status, and identifiable status may coincide and they often do, as in the following example:

> In the first days of February it seemed to Matthew that the dock buildings were permanently ablaze. *There* the Mayfair unit would be sent whenever there were no fires to deal with in their own district, (Farrell, p. 475)

But the three statuses are independently variable. All three resources are thus concerned with ***textual statuses*** and they point to the need to plan and maintain this information in the dynamically updated records of the context generation context.

In Section IV:2.3.4.1.2, I made a distinction between a process as a configuration of the nuclear process, participants, and circumstances, and a process as a temporally instantiable event. The first perspective on the process is reflected in the transitivity part of clause grammar, and the second perspective in verbal group grammar, e.g. in tense. As I pointed out above, a similar distinction can be drawn for objects. We view them both in terms of general experiential categories and in terms of situation-specific categories.

(i) In the first perspective, an object is represented in terms of *general categories of experience* -- a general primary class from some taxonomy (Thing), possibly with subclassifications to increase the taxonomic depth (Classifiers) and descriptive attributes (Epithets); for example:

```
mineral deposit
disseminated magmatic deposit
metamorphic rock
thermal metamorphic rock
```

In any given discourse context, there is a potential set of representatives of the experiential class of object being represented.[11] For instance, the potential set of representatives of the class of 'thermal metamorphic rock' may be either a generalized set (as in a geological text) or the set in some particular neighbourhood (as in my description of my Sunday walk).

(ii) The second perspective is concerned with a *situationally determined category* -- with a current set of representatives; with a discourse referent. The parameters in this perspective are situationally variable, as they are in general within the textual metafunction; for instance:

```
they
she
these
those same first two
the usual three
others
some
any
```

These examples are pronouns or pronominal uses of determiners; they specify the second perspective without the first. However, both perspectives are integrated in nominal group with lexical heads. DETERMINATION is the grammatical resource for indicating how the current set of representatives of the second perspective relates to the potential set of representatives of the first perspective:[12] is the current set of representatives identifiable or not; if it is,

[11] The notion of representative includes instances as well as subtypes; i.e., the experiential class may be represented either by instance or by subtype -- the two modes of exemplification. The context determines which kind is relevant. Since the notion of representative includes instances as well as subtypes, it differs from the the notion of extension.

how is it to be identified; if not, how is to be selected from the potential set of representatives? -- and so on. The difference between the two perspectives is brought out by adjectives such as *similar* and *identical* (cf. Halliday & Hasan, 1976); these can function in either perspective as Post-deictic, characterizing the current set of representatives, or as Epithet, characterizing the potential set of representatives. For instance, contrast the following pair of examples:

> He asked the second candidate (Deictic:) the (Post-deictic:) identical (Numerative:) three questions (as he had asked the first candidate).
>
> He asked the second candidate (Numerative:) three (Epithet:) identical questions.

In the first example, *identical* serves as Post-deictic, ordered before the Numerative element; it compares the current set of representatives to another and there may be a postmodifier providing the standard of comparison. The questions themselves may be quite dissimilar (cf. *he asked the second candidate the identical three varied questions*). In the second example, *identical* serves as Epithet, ordered after the Numerative element; it characterizes the class of question as being internally identical. I will return to the role of POST-DETERMINATION (*same, other, typical, alleged,* etc.) in characterizing the current set of representatives at the end of this section.

The most general DETERMINATION choices are given in the network fragment below.

---

[12] The sketch here represents an alternative approach to the attempt to encode the information realized by the determiner functioning as Deictic in an expanded set of logical quantifiers such as E, E!, A and i (iota).

Basic systems	Examples	Basic meanings
→ specific → demonstrative	*the; this/that, these/those*	Current set of representatives identifiable by deixis
→ specific → possessive	*my, your, his, hers, ...*	Current set of representatives identifiable by possession
→ nonspecific → total	*all/no; every/each*	Current set of representatives is totality of potential set of representatives
→ nonspecific → partial	*a(n)/some [sm]; some/any; one; either*	Current set of representatives is part of potential set of representatives

Fig. IV:3-8: The most general DETERMINATION systems

Determiners are used with lexical nouns, as in *those three metamorphic rocks;* but we find the same kind of distinctions among pronouns as among determiners, of course. I will not discuss them, but will merely tabulate some of the parallels:

		determiner	pronoun
specific	demonstrative	*the; this/that, these/those*	*it; this/that, these/those*
	personal	*my, your, his, ...*	*I/me, you, he/him, ...*
non-specific	total	*all/no; each/every*	*[all]/none; nobody, nothing; everybody, ...*
	partial	*some/any*	*somebody, something anybody, anything*

Fig. IV:3-8: Determiner and pronouns -- parallels

Like THEMATIZATION, DETERMINATION depends on a dynamic model of the context. The model has to be able to support the specification of the current set of representatives in relation to the potential set of representatives. It has to be possible to determine whether a current set of representatives is identifiable to the reader or not. Non-specific determiners in particular overlap in coverage with the quantifiers of formal logic, but the distinctions are not the same. I think that from the point of view of English, it is misguided to force some of the instantial information into a quantification structure (cf. Bateman & Matthiessen, 1988).[13] I will now consider the demands on this part of the text base in some more detail.

[13] The basic problem is that information concerned with the textual reference of 'terms' is represented in terms of quantifiers binding variables. Simon Dik is working on a functional logic that seems to avoid this problem. In Penman, logical forms are differentiated into a verbalization graph and a quantification graph. The former does not contain any quantifiers, but only predicates and their arguments; it is partitioned by the quantification graph.

(i) Specific. I will take the case of specific determination first: the current set of representatives is presented as identifiable. The text base has to be able to handle different sources of identifiability; these different sources correspond to different aspects of the context itself (cf. Halliday & Hasan, 1976; Rochester & Martin, 1977); they are not mutually exclusive.

(a) **Anaphora:** context = prior text. A simple case of identifiability is not too hard: the current set of representatives has already been introduced in the text and has thus been established by the text itself as identifiable (anaphoric reference: e.g. *Farrell ... he*).

In a general account, the rhetorical component of the text base influences the choice of ***referring strategies,*** in particular pronoun vs. determined lexical noun vs. proper noun: the account will have to rely on the text organization for some kind of notion of paragraph, since different strategies are often used for referring to an identifiable referent depending on whether it is paragraph-initial or not (cf. Hinds, 1977; Fox, 1987; cf. also Givón (1983) on referring strategies and topic continuity). Here is an example from a news item. Two strategies are used, pronouns (underlined) and individual (proper) names (italicized), to refer to Marcos:

> *Former Philippines President Ferdinand Marcos* says the United States aided rebel military forces against him in the final hours of his regime, with Americans refueling and rearming helicopters that attacked his presidential palace.
>
> In an interview on Friday night's broadcast of ABC's "Nightline," *Marcos* also denied stealing or misappropriating money from his country, said he still considered himself president of the Philippines, and defended his wife's collection of 3,000 pairs of shoes.

A partial transcript of the interview was released by ABC News Friday night and portions were broadcast on "World News Tonight."

Marcos' 20-year rule ended Feb. 26 when he fled the country after a popular uprising ...

(The Desert Sun, 5/iv/86)

The choice of an anaphoric referring expression is often presented as the question of when to pronominalize. But this seems to me to be the wrong question, possibly taken over from transformational syntactic accounts from the 1960s; or rather, the question is asked the wrong way around. When the referent is identifiable, the unmarked strategy is to use a pronoun. We can see this very clearly when we track participants in texts. Pronouns are, on the whole, the commonest referring strategy, as is illustrated in the news item above. The question to ask is when to use a nominal referring strategy, i.e. a determined lexical noun or a proper noun. From a rhetorical point of view, we might hypothesize that a nominal referring strategy is used to signal a rhetorical shift such as a new paragraph.[14] In this respect, the choice of referring strategy is related to the use of thematic resources (cf. Section IV:3.3 (i) and the discussion of internal matter at the end of that section). The problem is that this observation is quite vague. To sharpen it, we need a good deal of discourse study. However, we can also sharpen for particular registers: it seems that the nature of the rhetorical influence varies from one register to another. Fox's (1987) description of the differences between casual conversation and written expository text can certainly be interpreted as a registerial difference. The following two short literary biographies illustrate a use of the nominal referring strategy that is similar and yet different from the one found in short news items.

[14] There are clearly other non-rhetorical factors such as the need to convey attitude or role played and the need to differentiate from other similar referents.

Balraj Khanna was born in the Punjab, India, in 1940. He was educated at Punjab University, Chandigarh, then moved to England for further studies, but instead took up painting. He has lived in England and France since 1940. One of India's leading contemporary painters, Khanna has often been compared to Paul Klee. His paintings have been exhibited in London, Paris, New York, New Delhi and many other cities and his work is represented in over fifteen public collections. Balraj Khanna now lives in London. "Nation of Fools" is his first novel. (Khanna)

Leonard Woolf was born in London in 1880. The first landmark of his career was undoubtedly Cambridge and the friends he made there. The next was Ceylon, where he served in the Civil Service from 1904 to 1911. He was Assistant Government Agent in Hambantota - the 'Kamburupitiya' of "The Village in the Jungle" - when he went to England on leave.

In 1912 he resigned from the colonial service to marry Virginia Stephen, the writer.

He made a new career for himself in the world of letters and politics in London as writer, editor and journalist. In 1917 with his wife, Virginia Woolf, he founded one of the most influential and successful publishing firms, The Hogarth Press. For many years he took an active part in politics and the activities of the Labour Party. He began writing his "Autobiography" when he was nearly eighty and it will be by that work as well as "The Village in the Jungle" that he will be best remembered as a writer. Leonard Woolf died in 1969, aged eighty-nine. (Woolf)

The current set of representatives may be identifiable by virtue of standing in one of a small set of relations (e.g. part-whole) to a previously mentioned referent without having been mentioned previously itself -- so-called bridging (cf. Clark, 1975): *Leeks have one fault. Because they are blanched* <u>*the stem*</u> *seems to accumulate ...*). The ideation base has to be organized in such a way that the relations that are used in bridging are supported.

(b) **Exophora:** context = context of situation. The context may be the (immediate) context of situation: the current set of representatives is identifiable

by virtue of being part of the setting of the speech event, as in *Rock Cakes. Heat the oven to 425 ° F.*

(c) **Homophora** (generalized exophora): context = context of culture. The context may be the (general) context of culture: the current set of representatives is identifiable by virtue of being part of shared cultural knowledge (generalized exophoric or homophoric reference: *the sun, the boss, the queen*).

(d) **Cataphora:** context = subsequent text. The context may be the subsequent text: the current set of representatives is identifiable by virtue of an anticipated future mention in the text (cataphoric reference: *let me tell you this:* ...) and so on.

The different sources of identifiability are diagrammed below.

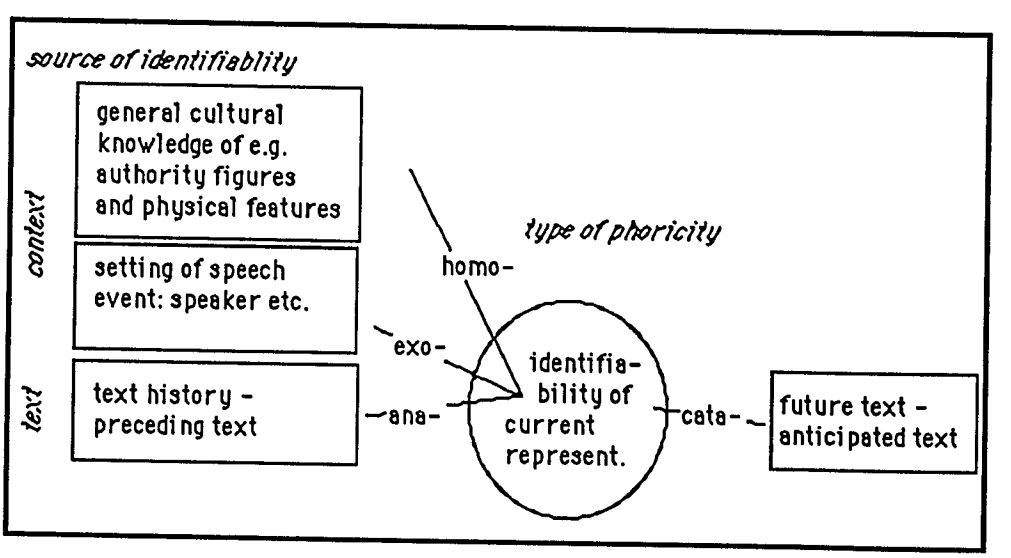


Fig. IV:3-9: Sources of identifiability

(ii) Non-specific determination. Now, let me turn to non-specific determination. I will interpret the brief account given in Halliday (1985: 161) and will elaborate on it. Non-specific determination is not concerned with how to identify an already established current set of representatives but with how the current set of representatives is selected from the potential set of representatives: whether it is a complete or only partial selection, whether is is picked out selectively or not, and so on.

The general distinctions are the same for both singular representatives and non-singular (i.e., mass or plural) representatives. The are tabulated below.

			singular	non-singular
total	positive		every; each	all
	negative		no	
partial	selective	restricted	one / some	
		unrestricted	any	
	non-selective		a(n)	some [sm]; --

Fig. IV:3-10: Non-identifiable DETERMINATION (excluding *either; both*)

The most general distinction is between the case when the current set of representatives is the totality of the potential set and the case when it is only part of the latter set:

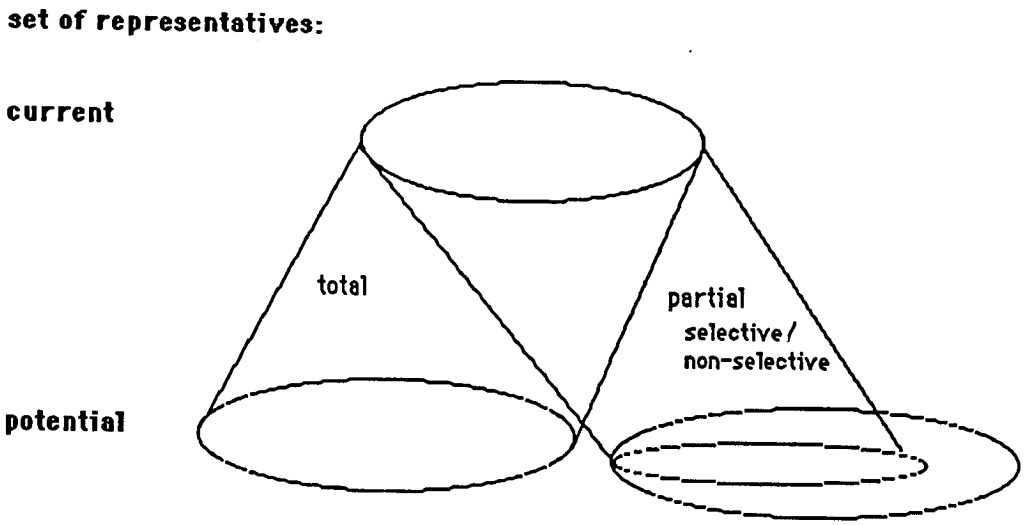


Fig. IV:3-11: Total vs. partial

As noted earlier, the size of the potential set of representatives depends on the discourse context.

The **total** determiners include *all* and *no* (non-singular) and *every/each* (singular). The latter are segregatory; they indicate an iteration over each instantiation of the class rather than an instantiation of the class as an undifferentiated whole:

> *All* language courses are designed to a specific purpose and in this sense can all be said to be directed at specific purposes.
>
> If purpose is interpreted simply as what people need to do with their language then there will of course be a whole host of different purposes associated with various universes of discourse, types of interaction and so on, and *each* will yield a different description.
>
> (Widdowson)

The **partial** determiners include (i) selective *some* ([sAm]), *any*, *one;* and (ii) non-selective *some* ([sm]) or the lack of a determiner, and *a(n).*

(i) Selective partial. The first set indicates that the instantiation of the class is selective; the manner of the instantiation matters. The selection is either restricted (*some, one*) or unrestricted (*any*). For instance (ESP is English for Specific Purposes):

> By objectives I mean the pedagogic intentions of a particular course of study to be achieved within the period of that course and in principle measurable by *some* assessment device at the end of the course.
>
> Now in *some* kinds of ESP, training, as I have defined it, may well be appropriate, ...
>
> The problem for *any* ESP course design is to find its place on the continuum.
>
> (Widdowson)

(ii) Non-selective partial. The second set does not give any information about the selection in the instantiation; what is important as far as the determination goes is just the number of the class instantiated (singular or non-singular):

> I am suggesting, then, that as generally conceived, ESP is *a* training operation which seeks to provide *0* learners with *a* restricted competence to enable them to cope ... (op cit.)

DETERMINATION may be further elaborated by the resources of **POST-DETERMINATION** (see Halliday & Hasan, 1976: 159-61; Halliday, 1985: 162), which serves to characterize the current set of representatives in either of two ways.

(i) The representatives may be compared in similarity to another mention of the same set of potential representatives: the are specified as identical (*same, identical, equal*), similar (*similar*), or different (*other, different*); for example:

> For each size of saucepan two parts are obtainable as extras, a bowl-shaped part with two handles which transforms the pan into a double saucepan (the bowl can be lifted out and wiped and used as a serving dish). The *other* section has holes in the base, so that the saucepan can be used as a steamer. (Highton & Highton)

> Cucumber. Yet an*other* vegetable that always appears to be associated with salads, but it can be very good cooked.(Highton & Highton)

Here it is necessary for the context model to keep track of information not only about previous sets of current representatives but also about the sets of potential representatives.

(ii) POST-DETERMINATION may also serve to characterize the way in which the current set of representatives is selected from the potential set of representatives. This includes particularity (*certain, particular, specific, random*), typicality (*typical, usual, regular; famous, notorious*), and modality-evidentiality (*possible, probable; alleged, supposed; obvious*); for example:

> Prepare the vegetables in the *usual* way and cut even-sized into pieces if necessary. (Highton & Highton)

> Fruit ice lollies can be made by freezing pure fuit juices in special moulds. The moulds can be bought from kitchen supply shops. These *particular* lollies are much better for children than the artificially flavoured and coloured lollies generally offered for sale.(Highton & Highton)

3.7 Conclusion

The types of phenomena specified in the ideation base define possible types of representatives. Specific pronouns can be used to refer to participants, of course. But the referents of *this, that,* and *it* (cf. also relative *which*) can be extended in two ways, which correspond exactly to the two perspectives we can put on phenomena: (i) 'composition', from micro or simple to macro-phenomena; and (ii) order reality, from phenomena meta-phenomena.

(i) Macrophenomena. They can be extended literally from micro to macro -- extended reference in Halliday & Hasan (1976), as in:

> It's called reverse Robin Hood. It's taking from the poor and giving to the rich. And <u>that</u> is not fair. 'taking from the poor and giving to the rich' (LAT, Jesse Jackson)

(ii) Metaphenomena. They can be extended metaphorically, from phenomena to metaphenomena -- text reference in Halliday & Hasan (op cit.), as in:

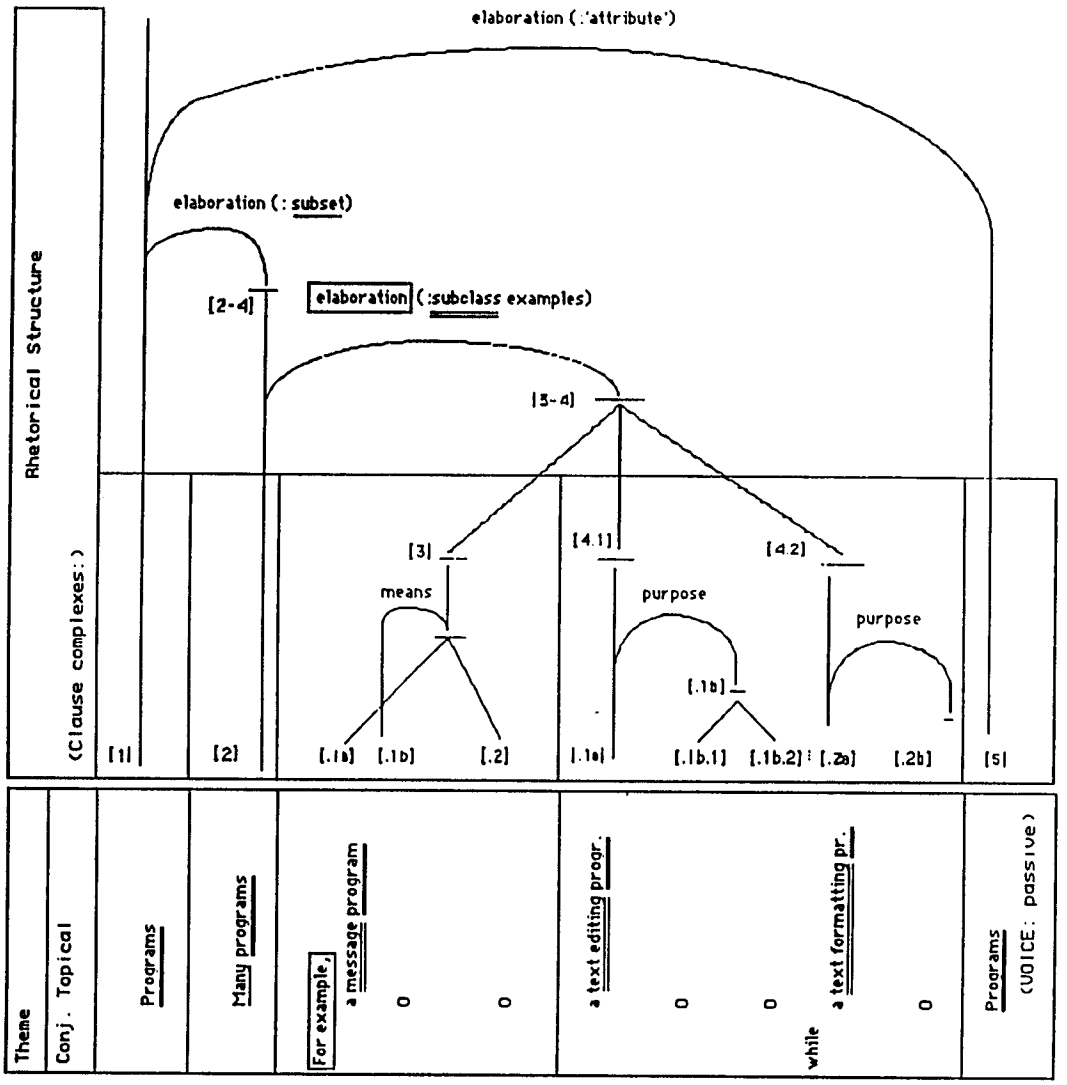
> [The Queen said;] 'Curtsey while you're thinking what to say. It saves time.' Alice wondered a little at this, but she was too much in awe of the Queen to disbelieve <u>it</u>. 'that curtseying while ... saves time'

Halliday & Hasan (op cit.: 52) offer the following example to illustrate the difference between the two types:

> It rained day and night for two weeks. The basement flooded and everything was under water. <u>It</u> spoilt all our calculations.

The pronoun *it* refers either to the macrophenomenon of raining and flooding, in which case the calculations are physical records, or to the metaphenomenon, the fact, that it rained, in which case the calculations are forecasts of the weather. The resolution of this ambiguity thus takes us back to the taxonomy of phenomena in the ideation base.

The examples above illustrate how the ideation base and the text base both contribute to the creation of text. Here the particular textual contribution is to 'summarize' information already introduced by means of REFERENCE.



4. Conclusion

I observed at the beginning of this section that the textual resources of the grammar need the support of a dynamic discourse model. One important aspect of this model is a plan for the organization of the discourse (text) itself. The textual resources do a lot of the work involved in realizing this plan. We have seen several examples of the role the plan plays in this section:

THEME selection is guided by the method of organization that is operative at any given point in the unfolding text. For example, if the text is being organized temporally, temporal themes are typically selected.

The resources of CONJUNCTION are used to mark the rhetorical relations being used to organize the text, relations such as elaboration, temporal sequence, and contrast.

The resources of DETERMINATION are employed partly to indicate shifts in stages in the organization of the text. For example, paragraph initial references to a particular referent tend to be different from subsequent references.

This concludes the survey of the ideation base, the interaction base, and the text base.

CHAPTER V: CONCLUSION

In this thesis, I have addressed text generation as a linguistic research task, more specifically a research task for systemic-functional linguistics. In this respect, the discussion contrasts with most work on text generation, since it takes place within computational linguistics and artificial intelligence at departments of computer science and electrical engineering or within projects at research institutes and computer companies.

To summarize aspects of the discussion, I will identify a few themes that run through it either as themes explicitly embodied in its organization or as more implicit recurrent themes.

I will start with the potential tension between text generation and linguistics -- between two different disciplines concerned with language, between application and theory, and so on. In a study of science and creativity, Bohm and Peat (1987) explore what factors stand in the way of creative progress and point to ***fragmentation*** as a major problem:

> Science today is exerting an ever-increasing influence over the world's societies, yet at its very heart, it is beset with serious difficulties. One of the most pervasive of these involves its fragmentary approach to nature and reality. ... Fragmentation ... arises when an attempt is made to impose divisions in an arbitrary fashion, without any regard for a wider context, even to the point of ignoring essential connections to the rest of the world.

Bohm and Peat identify a number of reasons why fragmentation arises:

> ... fragmentation arises in scientific communication and this becomes embedded in the very way the languages of science are used. And since the causes of such fragmentation are in general mainly subliminal, they are extremely difficult to detect and to correct.

A more general subliminal cause of fragmentation in science involves what might be called "the tacit infrastructure of scientific ideas".

Bohm and Peat note that fragmentation is not restricted to science but is pervasive in life. We certainly find fragmentation in the study of language, communication, and information. The tacit infrastructure of ideas is similar to what has been explored in terms of ideology in systemic linguistics and we can see that there are different ideologies within linguistics, which operate with metalanguages that often have low intertranslatability. We can also see that there is a danger of fragmentation when language is studied within different disciplines. If we are concerned with text generation as a linguistic research task we have to face at least one interdisciplinary division: the approaches to language within AI and computational linguistics -- within natural language processing -- and within systemic linguistics.

The conditions for avoiding fragmentation between systemic linguistics and another discipline focussing on language are good from the point of view of systemic linguistics. They are embodied in Halliday's (1985) notion of ***permeability from outside;*** after a brief account of some of the influences on the development of systemic linguistics, he notes:

These very sketchy references will perhaps serve to bring out what I think is a salient feature in the evolution of systemic theory: its permeability from outside. By 'outside' I mean not only outside itself, from other theories of language such as tagmemics and stratification theory, but also from outside linguistics, from disciplines for which language is not the object of study but rather an instrument for some purpose ... Systemic theory has never been walled in by disciplinary boundaries; this is not to imply that the concept of a discipline is vacuous, but that a discipline is defined not by what it studies but by questions it seeks to answer, so that in order to understand language, which is what the questions of linguistics are about (the noun 'language' is of course a grammatical metaphor - Peter Doughty preferred to talk about 'languaging' to show that our object of study is more process than entity), we have to study many other things besides, and hence a linguistic theory has to be a means of intersemiotic translation, interfacing with other theories of social meaning and so facilitating the input of findings from elsewhere.

Intersemiotic translation implies an exchange of meanings -- an ongoing dialogue between 'inside' and 'outside'. There are already well-established contexts of such exchanges between systemic linguistics and linguistics in general and areas such as education, literary studies, and the sociology of learning. There is less of a well-established context between linguistics and natural language processing. Lamb (1984: 5) notes

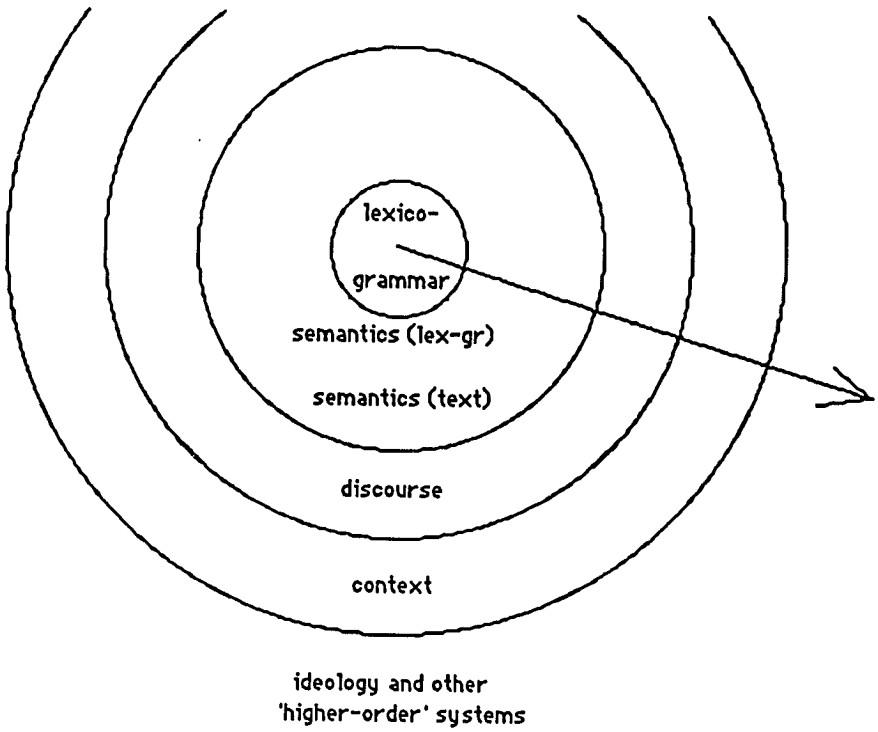
Still another area in which findings of linguistics can be useful is artificial intelligence, a branch of computer science closely related to cognitive psychology. As this field has developed during recent years it has paid more and more attention to language, ... And although the fields of linguistics and artificial intelligence have much to contribute to each other, there has been rather little interaction in recent years. Linguists would do well to pay more attention to what is going on in computer science. Thus the systems for understanding discourse, the structures and processes that make it possible for you to understand what I am saying, for example, are being more intensively investigated in computer science departments and in laboratories in the computer industry than in linguistics departments, even though this area is logically a major concern of cognitive linguistics.

The relatively low degree of interaction Lamb points to applies text generation as well as to natural language processing in general. There is a fragmentation

standing in the way of increased interaction. By attending to the boundary between natural language processing and linguistics, we can increase the "intersemiotic translatability", help avoid fragmentation and facilitate "the input of findings" from outside.

One crucial step in this process is to construct complete linguistic models of text generation so that computational models can be interpreted and complemented. This thesis does not address this task. Rather, I have taken a much smaller prior step: I have tried to identify linguistic issues that arise in text generation and to suggest approaches to these issues. These issues are theoretical as well as descriptive; text generation makes demands on theory as well as on description. If we address the problems of text generation both within natural language processing and within linguistics, we have taken a first step towards intertranslatability.

I have looked at the boundary between natural language processing and linguistics from inside-out: I have approached the computational 'outside' from systemic linguistics, starting with the 'core' of language -- lexicogrammar -- that falls most clearly within linguistics and working outwards towards semantics, discourse, and context. As we move outwards, we move towards areas of study to which linguistics has expanded only more recently and where more work has sometimes been done within computational linguistics and AI. Diagrammatically:



The nature of the exchange changes as we move outwards. For instance, at the 'core' we find several examples of computational implementations of (systemic) linguistic work. In contrast, notations for representing contextual information have been developed independently within computational linguistics and AI.

I started with a discussion of how we can make use of systemic grammar in text generation (Chapter II) and what the particular version developed within the Penman project looks like, the Nigel grammar (Section II:1.2). I emphasized the importance of paradigmatic organization as a way of addressing the need for purposeful control in generation. I went on to ask what the task of text

generation implies for lexicogrammatical description (Section II:2). I suggested that the textual metafunction is of particular importance and that attention to it could improve the quality of texts that have been produced by various generation systems. Further, I noted that it is necessary to characterize the relations between the generalized grammar and register-specific ones.

Taking the Nigel grammar as the base, I then explored representational issues that come into focus in text generation (Section II:3). I identified three general areas where extensions to the base are needed: messes & markings, metafunctional diversity, and metaphor. I also addressed another kind of extension: the extension in delicacy from grammar to lexicogrammar (Section II:4). These extensions are still extensions within the level of lexicogrammar; they are aimed at increasing the lexicogrammatical potential metafunctionally, metaphorically, and in delicacy.

Next, I raised the question of what kind of semantics is needed in text generation (Chapter III). The answer, I suggested, is an interface that can mediate between lexicogrammar and its environment by making meaningful lexicogrammatical choices. I sketched the chooser & inquiry semantic interface developed for the Nigel grammar and then explored how it can be made to do more than it is capable of now.

Finally, I asked what the environment looks like from the point of view of the lexicogrammar and its semantic interface (Chapter IV). By the time we reach the environment, we have moved into the territory of artificial intelligence and computational linguistics. However, most attention has been given to the notation for representing (ideational) 'knowledge', to the art of knowledge

representation, and much less work has been done on the organization of this 'knowledge'. I suggested a metafunctionally founded organization into an ideation base, an interaction base, and a text base, and then I explored the ideation base and the text base in some detail.

The movement I have followed starts with lexicogrammar within systemic theory. It needs to be complemented in at least two ways to achieve a more balanced picture of text generation as a linguistic research task -- from 'above' and from 'outside'.

(i) From above. We need to move towards lexicogrammar from above, from higher levels of organization. We need to take context as the starting point, and ask how to get from context to text. Ideally, this should proceed from well-motivated theories and descriptions of context (and this is where the work of e.g. Malinowski and Bernstein becomes highly relevant).

(ii) From outside. We need to approach the boundary between computational work on text generation and systemic linguistics from outside, from the computational interpretation of the task of text generation.

The brief review of the organization of the thesis brings into focus another theme that runs through the discussion: the dimensions of the systemic model. The overall organization is ***stratal:*** it guides the direction in which I have pushed the enquiry, from lexicogrammar upwards. Another basic organizing concept is ***metafunction*** and I have used as a principle of organizing the discussion both within lexicogrammar and above it.

In a sense, the metafunctional movement has been from experiential to non-experiential -- logical, interpersonal, and textual. I characterized the baseline Nigel grammar presented in Section II:1 as experientially based or at least biased, particularly in terms of the realization operators and then I diagnosed a number of representational problems in terms of the other three metafunctional modes of organization. For instance, to accommodate the logical resources of the grammar we need a different interpretation of what can constitute a system and a choice in a system as well as a different notion of structure.

The metafunctions also help explain representational issues at the semantic level. They underlie semantic organization beyond the grammatical system and this organization creates problems for the chooser framework, since it is based on grammatical systems. One possibility is to move towards an independent semantic network of inquiries.

Looking upwards at the environment from the grammar and its semantic interface, I suggested that the metafunctions can provide the principle for organizing it into three bases -- the ideation base, the interaction base, and the text base. Each base support the resources of one of the metafunctions. I also noted that 'knowledge' representations are essentially notations for experiential 'knowledge'; the other metafunctional modes of organization raise problems for the art of knowledge representation.

A minor theme is ***grammatical metaphor.*** I discussed it as a representational problem for the basic grammar in Section II:3.3. The question is how it enters into the process of generation and how metaphorical as well as congruent alternatives can be made available. As a first step in approaching the

question, I outlined a typology of grammatical metaphor based on the context in which the congruent alternative would normally be chosen. The typology is also the starting point for exploring different types of solution. Some of these solutions rely on the existence of a semantic network (of inquiries) and I returned briefly to the treatment of grammatical metaphor in the discussion of the semantic level (Chapter III). Grammatical metaphors of a certain type identified in the typology were also important in the discussion of collocationally conditioned lexical choice in Section II:4. Finally, I noted that grammatical metaphor raises a number of very significant issues for 'knowledge' representation and the organization of the ideation base of a text generator (Section IV:2).

Another minor theme is the need for both ***static and dynamic models.*** Linguistics provides us mostly with static models of grammar and other levels of the linguistic system: these contribute to the resources of a text generation system. However, process accounts have been taken mostly from outside linguistics. This differentiation is reflected in my discussion. I have started with, and devoted most space to, static concerns and presented dynamic considerations such as the generation algorithm as defined in terms of these (Section II:1.2.1.6). However, I have also suggested that it is important to take a step back and to develop a dynamic version of the theory of grammar. There turn out to be other reasons for this move: when we turn to the logical mode of organization, we need to develop a dynamic account (Section II:3.2.4).

The stratal movement upwards entails a movement from the ***general resources*** of lexicogrammar ***to specific contexts*** in which texts are generated. The need to bridge the gap between general and specific has been

noted at several points in the discussion. I raised the issue first in connection with the consideration of the coverage of a text-generation grammar (Section II:2). On the one hand, we want to create a general generation capability. On the other hand, special-purpose grammars have often been developed as integral parts of systems for generating reports, explanations, and so on. One way of addressing the potential tension is to approach from both angles and also to work towards characterizations of registerial differences in grammar and how these differences relate to the general grammar. The question of general and situation-specific came up again in the discussion of the semantic interface between the generation grammar and its environment. One way of using the same general grammar in a number of different contexts of situation is to develop a number of different situation-specific semantices. This approach was contrasted with the general chooser & inquiry interface in Section III:6. Similar issues arise when we turn to the design of the environment. If we adopt a general chooser & inquiry interface (or some other general kind of semantics) it may in fact be necessary to compute responses to inquiries in different ways in different communication situations. Whatever the level, the generality of a text generation system will depend on its ability to deal with the specific.

What are future tasks, stated in relation to this thesis?

(i) In the thesis, I have touched on a number of aspects of a linguistic model of text generation; we need to move towards bringing these together into a unified linguistic model of text generation. As a way of managing the complexity of this, we can develop detailed accounts of particular registers, such as recipe generation, scene descriptions, and weather forecasts.

(ii) I have surveyed a number of areas, e.g. grammatical metaphor and collocationally conditioned lexical choice; the next step is to increase the delicacy of the account, possibly in the context of some particular register such as economic reports or weather forecasts.

(iii) I have identified a number of problems areas and sometimes sketched or hinted at solutions. We now have to find solutions or flesh out the ones mentioned in the discussion, working towards implementation. One of the major challenges here is to develop dynamic models.

(iv) Apart from continuing in the direction I have moved in the thesis, we need accounts of the complementary movement mentioned earlier -- the movement from context to language.

A number of these 'future' tasks are, of course, already being addressed. Some of these will be discussed in Bateman & Matthiessen (in prep.) -- logical and textual grammar -- and Halliday & Matthiessen (in prep.) -- metaphor. Kasper is addressing a number of grammatical representational issues within Functional Unification Grammar.

In pursuing text generation as a linguistic research task, I have focussed on issues that are, in one way or another, suggested by the current state of the art. I have not, however, excluded aspects of these issues that fall outside what can be addressed in a computational generation system in the late 1980s: one of the contributions linguistics can make is to look ahead and discuss phenomena

we don't know how to formalize and integrate within a text generator yet. For instance, I think it will take quite some time before we can begin to think about implementing a generator that can produce the kind of grammatical intricacies we find in spontaneous casual conversation: not only do we need advances in the representation of grammar, but we also need to break a barrier in knowledge representation.

At the same time, I have not focussed on certain phenomena that lie at the very heart of 'languaging' but which I think have not come into focus in text-generation yet. For instance, while I have noted the need to bridge the gap between general resources and specific situation types, this is only the beginning of the situatedness of text. Situadness is also instantial and a text in a particular context of situation serves to maintain the system as well as to modify it -- except that modification is the wrong notion, since the system itself is not static and closed; it is dynamic and open.

The instantial re-creation of the linguistic system is probably the clearest in verbal art. I noted the existence of register-specific semantic systems of tense in Section III:6. These systems belong to particular types of texts-in-contexts. But we also find systems unique to a particular text in one way or another; these systems come into being as the text unfolds. For instance, Michael Frayn's novel *A Very Private Life* starts out as follows.

> Once upon a time there <u>will be</u> a little girl called Uncumber.
>
> Uncumber <u>will have</u> a younger brother called Sulpice, and they <u>will live</u> with their parents in a house in the middle of the woods. There <u>will be</u> no windows in the house, because there <u>will be</u> nothing to see outside except the forest. While inside there <u>will be</u> all kinds of interesting things - strange animals, processions,

> jewels, battles, mazes, convolutions of pure shapes and pure colours - which *materialise* in the air at will, solid and brilliant and almost touchable. For this will be in the good new days a long, long while ahead, and it will be like that in people's houses then. So the sight of the mud and grimy leaves outside would scarcely be of much interest. (Frayn, p. 5)

A new semantics of tense is being set up and this is indicated at the outset by the unexpected combination of *once upon a time* and the simple future. It would seem that the new system simply entails the replacement of primary past by primary future to create narrative time. However, as the following excerpts illustrate, this is not the case; all three terms in the primary tense system occur, but they are used in different ways and the creation of the semantics that controls these uses is something that only evolves gradually:

> Uncumber can just remember the arrival of Sulpice. It **was** when she **was** three. A large parcel **arrived** through the delivery tube for her mother, and her mother **became** strangely excited and shy about it. (Frayn, p. 5)

> 'Do you die when you get old, Mummy?' Uncumber will ask one day.
>
> 'Sometimes,' her mother *replies*. (Frayn, p. 10)

> One of the earliest of Uncumber's remarks to pass into the family folk-lore will be about the repairmen. Whenever something *goes* wrong with the house - when the protein supply *gets blocked*, say, or the holovision chambers *go* on the blink - the repairmen *come* down from the sky and strip panels off the outer walls until they *find* the fault.
>
> One day she will hear the familiar clink of their tools on the other side of the wall, and their muffled talk and laughter, and she will say: 'The animals are here again!'
>
> It'*s* all mixed up inside her head with some holovision program she *has seen*. She *thinks* people live inside, and animals outside. (Frayn, p. 12)

The point here is not the particular use of the tense system here; it is the way in which language serves to create an interpretation of the world and the 'tension' between the general system and a more specific one.

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APPENDIX 1: GLOSSARY

Actor. Transitivity function in a material clause; the participant always inherent in the clause according to the transitive model of transitivity. The process it participates in may or may not extend to affect another participant, the Goal. For instance, (Actor:) *Henry* (Process:) *dove;* (Actor:) *Henry* (Process:) *kicked* (Goal:) *the ugly duckling.* (The term Actor is to be distinguished from the term Agent. While the former is confined to material clauses in the transitive model, the latter is a generalized transitivity function -- the 'causer' -- in the ergative model.)

Adjunct. Interpersonal clause function: constituent that is not an alternative Subject (in contrast to a Complement). Adjuncts are experiential (circumstances), textual (conjunctives), or interpersonal (modal adjuncts or comment adjuncts). For instance: (Adjunct: textual) *However* (Adjunct: interpersonal) *unfortunately we can't meet*(Adjunct: experiential / Locative) *at noon.*

Agent. Transitivity function in clause, according to the ergative transitivity model: the participant causing the actualization of the combination of Process + Medium. In a material clause, it is the Actor; in a mental one, the Phenomenon; and in a relational one, the Attributor or the Token. For instance: (Agent:) *The wind* (Process:) *broke* (Medium:) *the window;* (Agent:) *The mouse* (Process:) *scared* (Senser:) *the brave elephant;* (Agent:) *They* (Process:) *elected* (Medium:) *her* (Range:) *president;* (Agent:) *Black* (Process:) *represents* (Medium:) *mourning.*

backward-chaining. In AI, direction of inference, particularly in a production system: working from actions to conditions of actions. In the context of a system network, it entails working from right to left, from more delicate to less delicate. In particular, the entry condition of a system is inferred from the selection of one of its features.

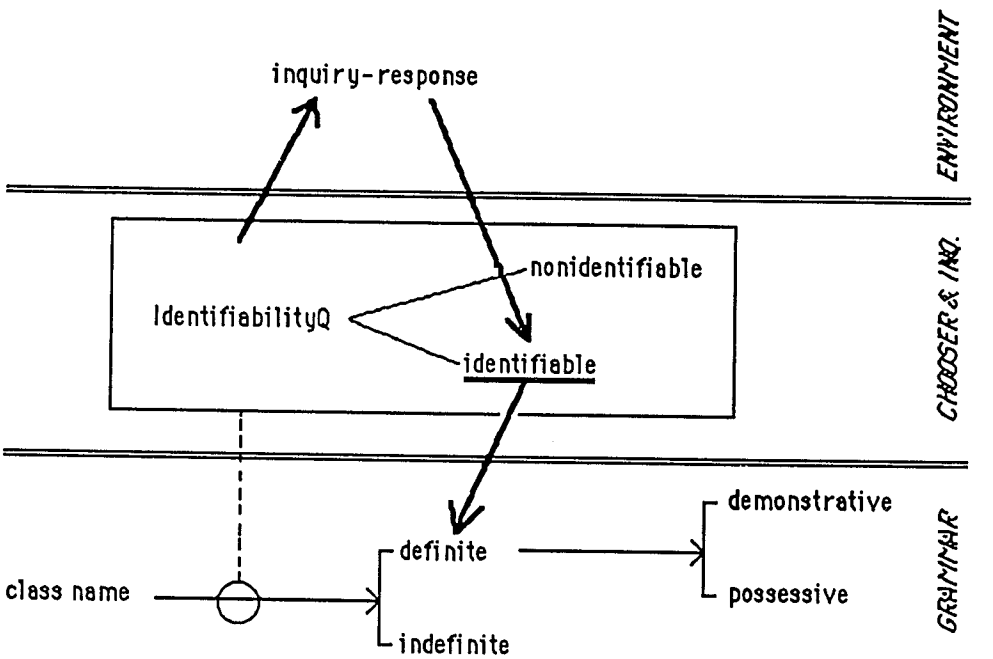
Beneficiary. Transitivity function in the clause, according to the generalized ergative transitivity model: the participant benefitting from the actualization of the combination of Process + Medium. In a material clause, it is the Recipient (*My aunt gave the farmer a duckpress*) or the Client (*Pour me out a cold Dos Equis beer*) and in a verbal one, it is the Addressee (*Joe told us all about Eve*). It also occurs in a few relational clause types (*I owe you an apology*) and mental clauses (*I envy you your luck; I don't begrudge you your happiness*).

category. A construct or abstraction in systemic theory; units, functions, classes, and so on are categories of the theory of grammar (cf. Halliday, 1961). The term for the category of formal grammar is the traditional term class (as in word class).

chooser and inquiry framework. A framework for making semantically motivated grammatical choices. Each system in the grammatical system network is equipped with a chooser. It is organized as a decision or discrimination tree, where the branches are defined by inquiries. The chooser presents an inquiry at a time to the *environment* of the grammar and its chooser and inquiry interface; the response constitutes a branch in the decision

tree of the chooser. The chooser of a system will select one of its terms after asking one or more inquiries.

For example, to determine whether a nominal group should select for definite or indefinite, the chooser of this DEFINITENESS system presents the inquiry IdentifiabilityQ to the environment to find out whether the referent being expressed is identifiable or not. If it is identifiable, the grammatical feature definite is chosen; otherwise, indefinite is chosen:



circumstance. Generalized transitivity function in the clause, which consists of a process, participants involved in it, and attendant circumstances. The difference between participants and circumstances is a cline; it is comparable to

Tesnière's distinction between *actant* and *circonstant.*

class. The systemic linguistic term for the term category in formal grammar. It generalizes the traditional notion of word classes and thus applies to morphemes, groups, phrases, and clauses as well as words. The least delicate classes are sometimes called primary classes and further differentiations are secondary classes.

Classifier. Function in the structure of the nominal group; a premodifier specifying of subclassifcation of the thing represented by the nominal group. Classifier corresponds to Fries' (1970) close-knit modifier. It is usually realized by a noun. Classifier is differentiated from Epithet. For instance: *a* (Epithet:) *soft-spoken* (Classifier:) *Government* (Thing:) *aid.*

Client. Participant function in the transitivity function of the clause. It represents the participant a service is done for. It is related to one type of cause, viz. Behalf. For instance: *Sir Chris built* (Client:) *him a gazebo; Sir Chris build a gazebo* (Client:) *for him.* Cf. *I'll do it* (Behalf:) *for you.*

clause complex. Halliday's (1965, 1985) term for a combination of clauses related paratactically or hypotactically but not through embedding; the mode of combination is the mode of organization of the logical subtype of the ideational metafunction. For example, clauses combined through coordination form a clause complex.

cline. Introduced in Halliday (1961), in opposition to a hierarchy of discrete terms, as a continuum along a single dimension with potentially infinite

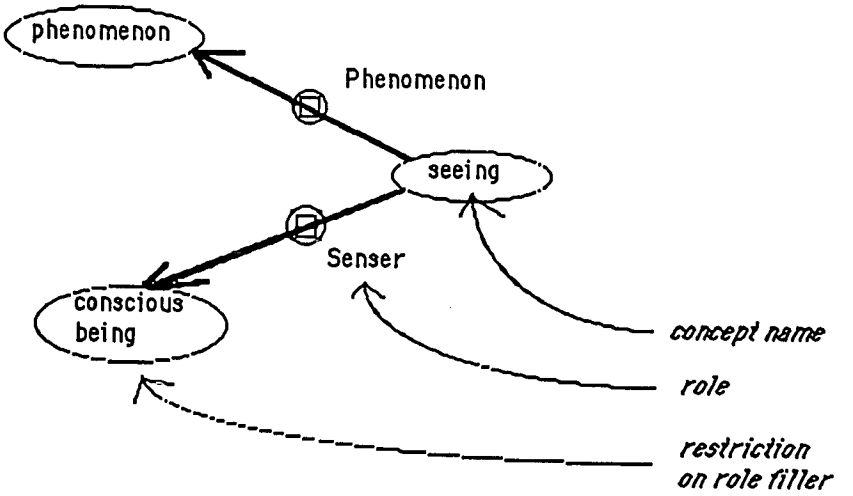
gradation. "Cline" might be glossed as scale, except that this term has a special technical sense, particularly in early systemic linguistics.

cohesion. The textual lexicogrammatical resources for expressing relations within text without creating grammatical structure. The cohesive resources include reference, substitution / ellipsis, conjunction, and lexical cohesion.

collocation. Non-structural, lexical relation between lexical items, measured as the likelihood of their co-occurrence in text.

complex. Complex of grammatical units of any rank or class, potentially lineally recursive; complexes include coordination and apposition.

concept frame. The representation of a concept as a frame of slots (roles) and their possible fillers. For example, in a notation based on Brachman (1978), the concept of seeing might have Senser and Phenomenon as roles and the concepts of conscious being and phenomenon as restrictions (value restrictions) on possible fillers of these roles:



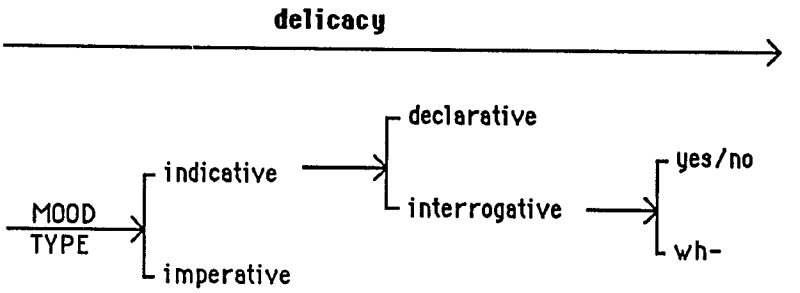
conflation. Realization operator used to specify the identity of two functions, as in Agent / Subject.

congruent. The 'literal' as opposed to the metaphorical realization of meaning: the congruence between semantics and lexicogrammar.

context. Context of culture; context of situation. Higher-order semiotic systems above the linguistic system. Context spans field, tenor, and mode. (In earlier writings, context was used for what is now called semantics.)

Deictic. Function in the structure of the nominal group, inserted as a realization of choices in DETERMINATION and realized by a determiner (or a rankshifted genitival nominal group). For instance: *the wages of sin.*

delicacy. The scale from general to specific. In a system network, delicacy corresponds to the ordering of systems from left to right by means of entry conditions. For example, the following systems of MOOD increase in delicacy from left to right:



domain. Knowledge domain: CL notion comparable to the systemic notion of a particular field.

domain model. The model of a particular domain of knowledge in the knowledge base. Domain models are more specific than and are thus classified under the 'upper structure' model developed for Penman.

entry condition. The condition under which the options specified by a system are available; that is, in terms of the traversal of the system network, the condition under which the system can be reached. An entry condition is a simple feature or a complex of features.

environment. The components of the Penman text generator that are outside the Nigel component, i.e., Nigel's environment. It includes the *knowledge base* and *text plans.* In the design discussed in Chapter IV, the environment is

organized metafunctionally into the ideation base, the interaction base, and the text base.

Epithet. Ideational nominal group function, representing qualities of the thing represented by the nominal group. Typically realized by an adjective. It corresponds to Fries' (1970) loose-knit modifier. It is distinct from the Classifier function. For instance: *a* (Epithet:) *delightful* (Classifier:) *summer* (Thing:) *evening.*

experiential. One of the two subtypes of the ideational metafunction. It is the resource for representing experience. Its mode of organization is constituency. It corresponds (more or less) to what has been called functions of Darstellung, representation, denotation, cognitive content, semantics.

feature. The primitive of a system.

field. Field of discourse; one of the components of *context.* The field is the social activity relevant to a text; it includes the traditional notion of subject matter.

forward-chaining. In AI, direction of inference, particularly in a production system: working from conditions of actions to actions. In the context of a system network, it entails working from left to right, from less delicate to more delicate. In particular, moving from the satisfaction of a system's entry condition to the selection of one of its terms.

function. (i) micro-function: functionally defined constituent; e.g. Subject, Actor, Theme. (ii) macro-function: language use in early child-language, before use and metafunction have become differentiated. (iii) metafunction: generalized functional principle of linguistic organization. There are three metafunctions -- ideational (experiential + logical), interpersonal, and textual.

Function Association Table. The record kept of associations established by identifying inquiries between function variables and their hub values. During the traversal of the system network, the response to each new identifying inquiry is added to the Function Association Table.

function structure. A structure is made up of a configuration of grammatical functions such as Actor, Subject, and Theme. Each function may be realized by either a set of grammatical features or a set of lexical features. The grammatical feature set constitute a preselection of features that have to be chosen when the grammar is reentered to develop a function further. For example, the function Actor may have the associated preselection 'nominal group', which means that once the structure of the clause of which Actor is a constituent has been fully defined, the grammar is reentered and Actor is developed as a nominal group.

functional dialect. The Prague School notion of functional variation; corresponds to the systemic notion of register.

Generic Structure Potential (GSP) is Hasan's term for a statement of the resources for structuring a particular type of text. 'Generic' is related to genre: the structure is defined for a particular genre such a type of service encounter, a type of advertisement, or a nursery tale. 'Potential' refers to the fact that a given

generic structure potential specifies the set of possible structures for a defined genre. For example, Hasan gives the following specification for a service encounter (Halliday & Hasan, 1980: 27):

[(<Greeting> ·) (Sale Initiation) ^] [(Sale Enquiry * ·) {Sale Request ^ Sale Compliance}* ^] Sale ^ Purchase ^ Purchase Closure (^ Finis)

KEY:

( )	optional element
A · B	unordered elements
[A · B]	the domain of the mobility of unordered elements
A ^ B	ordered elements, A preceding B
A < B >	inclusion, B included within A
*	linear recursion (iteration), repeated selection of an element or a pair of elements of structure

The structure consists of a number of elements (or functions). The first element, Greeting, is optional, which is indicated by round brackets. It may either precede or follow Sale Initiation; the sequential freedom is indicated by the raised dot "·'. Ordering is indicated by the circumflex "^"; the possibility of inclusion is shown by angle brackets. The asterisk * indicates linear recursion (iteration); an element or a pair of elements can be selected more than once. (Hasan uses a curved arrow.)

Example (op cit., p. 20):

Sale Request: *Can I have ten oranges and a kilo of bananas please*

Sale Compliance: *yes anything else*
no thanks

Sale: *that'll be dollar forty*

Purchase: *two dollars*

Purchase Closure: *sixty, eighty, a hundred two dollars an' thank you*

Hasan's Generic Structure Potential is formally similar in most respects to McKeown's (1982) later notion of rhetorical schema.

Given. Textual function of the information unit: information presented as recoverable to the listener. Part of the Given ^ New structure of the information unit. Unless the assignment of New is marked, the boundary between Given and New is variable.

Goal. Transitivity function of the material clause, in the transitive model of transitivity; comparable to Patient. For instance: *They shoot horses don't they.*

grammar. The term has the traditional sense in systemic theory. It includes syntax as well as morphology, the two simply having different domains on the grammatical rank scale. Grammar is taken to be the most general part of lexicogrammar, the resource for expressing meanings.

group. Group is the rank between clause rank and word rank: groups function in clauses and are composed of words. A group is in many respect a group of words or a *word complex:* words enter into logical structure to form a group. This aspect of the group explains its difference from the ***phrase***; a phrase does not have a logical (univariate) structure but rather an experiential

(multivariate) structure: the structure of the prepositional phrase is like a miniature or the transitivity structure of the clause, viz. Minorprocess: preposition + Minirange: nominal group. In the terms of Bloomfield (1933), we can say that groups are endocentric and phrases are exocentric. If groups were only word complexes, we would not need them as a separate rank; there is more to them than logical structure. The degree to which other metafunctions contribute to their structuring depends on the class of group: cf. Halliday (1985: Ch. 6).

ideational. One of the metafunctions: language as ideation. It comprises two modes of 'ideating', the logical and experiential subtypes.

ideation base. The aspect of the environment organized to support the ideational resources of the grammar and its semantics.

interaction base. The aspect of the environment organized to support the interpersonal resources of the grammar and its semantics.

interpersonal. One of the metafunctions: language as interaction. The resources for establishing and maintaining the relationship between speaker and listener. It combines conative and expressive, which are not distinct in the linguistic system.

hypotaxis. One of the two types of logical interdependency, the other one being parataxis. Interdependency where the interdependents are of unequal status -- dependency.

KEY. Interpersonal region, with the information unit as point of origin. It includes those speech functional distinctions not expressed by MOOD systems in the clause.

knowledge base. Organization of information pertaining to particular domains of knowledge as well as highly general knowledge.

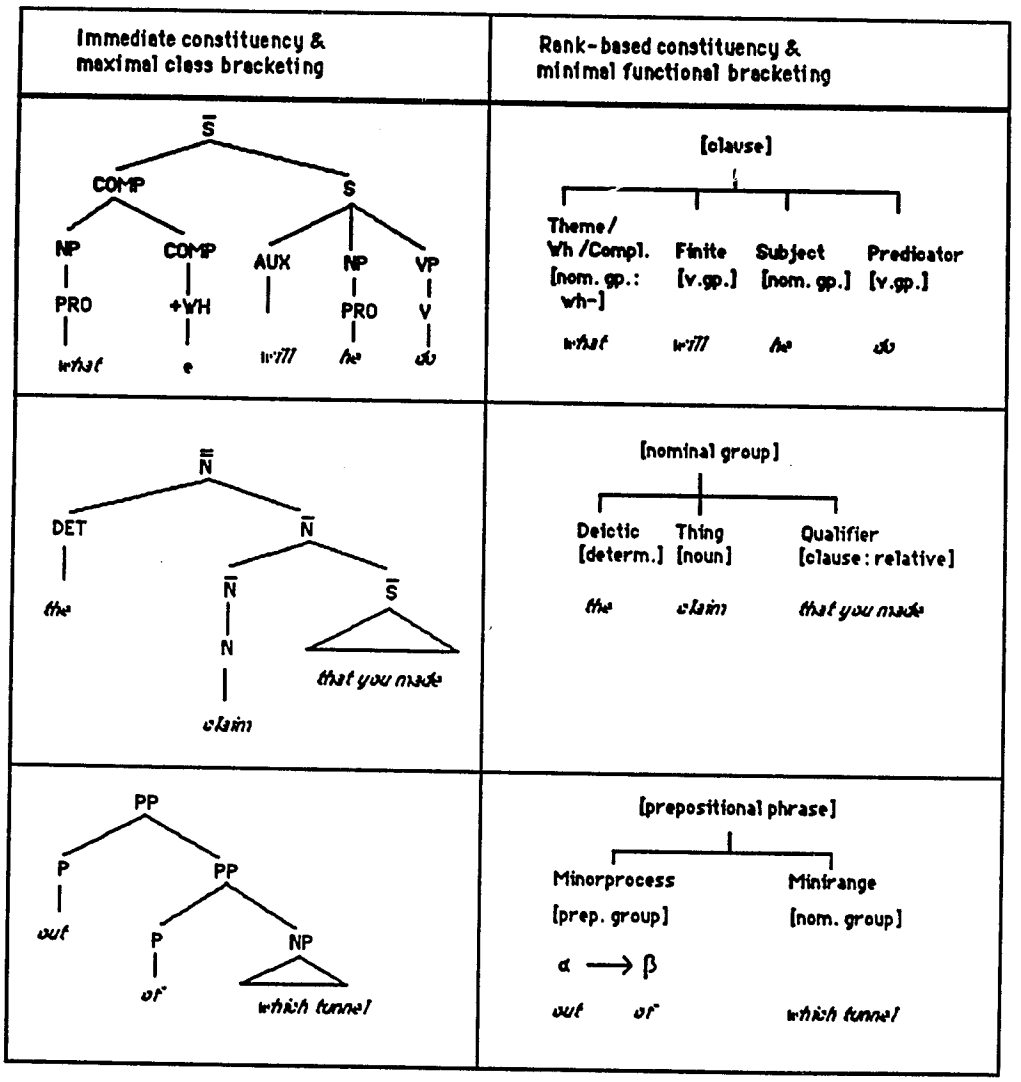
lexicogrammar. The combination of grammar and lexis; the resources for expressing meaning.

logical. A subtype, together with experiential, of the ideational metafunction.

metafunctions. The highly generalized functions language has evolved to serve and which are evidenced in its organization. Halliday (1967/8) identifies three metafunctions, the ideational, the interpersonal, and the textual. The ideational metafunction can be further differentiated into the experiential and the logical subtypes. Metafunctions are distinguished from *macrofunctions* and *microfunctions.* Macrofunctions can be identified in early child language (cf. Halliday, 1975); microfunctions are the functions of grammatical structure such as Subject, Agent, and Theme.

minimal bracketing. Minimal bracketing is differentiated from the maximal bracketing of IC-analysis. The rank-based constituency of systemic-functional grammar (and phonology) differs from the immediate constituency of formal grammar (and phonology). The former is associated with minimal functional bracketing, while the latter works with maximal bracketing in terms of grammatical classes. Some contrasting examples are given below (the formal

analyses are adapted from Radford, 1981).



mode. One of the components of *context.* It represents the role played by language in the speech interaction, including the medium (spoken, written, written to be spoken, etc.) as well as the rhetorical mode (expository, instructive, persuasive, etc.). Mode is a second-order category in the sense that it is brought into existence by the existence of language itself.

modes of meaning. Refers to the different kinds of meaning associated with the different metafunctions (Halliday, 1979).

modes of organization. Refers to different kinds of syntagmatic or paradigmatic organization (Halliday, 1979), in particular, constituency, interdependency, pulse (period), and prosody.

Mood. Interpersonal clause function, in the interpretation of the clause as interaction. It typically includes Subject and Finite, but may also include modal adjuncts.

MOOD. Interpersonal clause region; the grammaticalization of speech function in the clause (accompanied by KEY in the information unit).

multivariate. A type of structure: the functions of a multivariate structure stand in different kinds of relation to one another. For example, the functions of the transitivity structure of the clause all have different values -- Actor, Process, Goal, Locative, and so on. Contrasts with *univariate.*

network. A relational type of organization; a graph. Examples include discrimination networks, the networks of stratificational theory, and system

networks. In systemic theory, a network is specifically a system network.

Nigel. The name for the sentence generation component of the Penman text generator developed at USC/ISI. It includes the systemic grammar of the generator and the semantic interface between the grammar and the rest of the system.

path augmentation. The computation of the path from a preselected feature in a system to the root of the system network, i.e. of the path that leads to the feature.

Penman. Text generation system being developed at USC/ISI.

phrase. Like groups, phrases constitute the rank intermediate between clauses and words. However, unlike groups they are not logically structured groups of words, but rather more like miniature clauses.

rank (scale). A hierarchy of units such as clause - group/phrase - word - morpheme or tone group - foot - syllable - phoneme. (It corresponds to hierarchy in tagmemic theory.) The rank scale reflects the basic realization patterns. Functions of the units at one rank are realized by units at the rank below. For example, clause functions are realized by groups/phrases and group functions are realized by words.

realization operator. Together with one or more operands, a realization operator makes up a realization statement. Realization operators include Insert, Conflate, Expand, and Order. See realization statement.

realization statement. A specification of a structure fragment, such as the presence of a function or its ordering in relation to another function, stated as a reexpression of a systemic feature or a combination of features. A realization statement consists of one *realization operator* and one or more operands. For example, the statement (Conflate Subject Agent) consists of the conflation operator Conflate and the operands Subject and Agent, which are grammatical functions.

register. A variety of language determined by a particular set of values of the context; it is determined by what the speaker is doing socially. The principle controlling variables are field [of discourse] (type of social action), tenor [of relationship between speaker and listener] (role relationships), and mode (symbolic organization). The notion of register is a generalization of the traditional notion of genre; it is also akin to the Prague school notion of functional dialect. Registers can be identified at different degrees of delicacy or specificity. For example, we can identify a particular register as written instruction in how to prepare food -- a recipe in a cookery book -- or, more delicately, as written instruction for an American public in how to prepare Thai food.

Residue. Modal function in the interpretation of the clause as representation. The part of the clause that does not constitute the Mood, i.e. the Predicator, complements, and (non-modal) adjuncts. The earlier term was Proposition. Residue is different from Predicate in the logical / traditional Subject ^ Predicate analysis in a number of respects. For instance, it only includes the Predicator part of the verbal group, not the Finite. Further, it is a rhetorical notion, not a logical one; it is the part of the clause often elided in dialogic exchanges (as in,

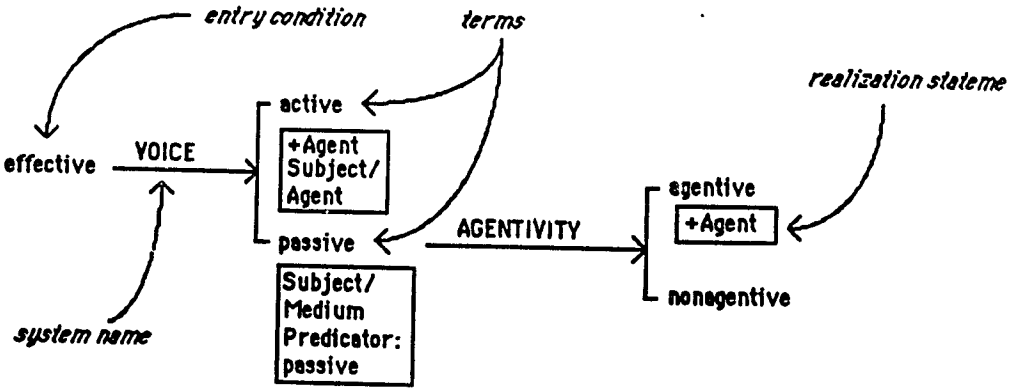
Mood: *He'll* Residue: *be here tomorrow. - No,* Mood: *he won't* Residue: --).

Rhetorical Structure Theory. Theory of text organization developed within the Penman project. It interprets text as being organized relationally. A rhetorical relation is typically asymmetric, relating two spans of text, a nucleus and a satellite. The spans of texts related rhetorically may have internal organization. A rhetorical relation is defined in terms of the conditions for using it and its intended effect on the addressee.

scale. Introduced in Halliday (1961) as the general term for rank, exponence (later, realization), and delicacy.

starting structure. The default structure for any grammatical unit posited by Fawcett (1980).

system. A system is the central category for representing paradigmatic organization at any stratum -- phonological, grammatical, or semantic. It consists of (i) a statement of a choice between two or more *terms*, represented by *features*, (ii) and an *entry condition*, which specifies when the choice is available. The entry condition is a simple feature or a feature complex; these features are terms in other systems. Because of their entry conditions, systems form *system networks.* Each term in a system may have one or more *realization statements* associated with it. (The realization statements specify structure fragments; from their vantage point, the system is like a 'metarule'.) Example:



tenor. One of the components of *context*. The role relationship between the interactants in a speech situation. It includes relations of formality, power, and affect. Tenor influences interpersonal choices in the linguistic system. For instance, the strategy chosen for issuing a command depends largely on the tenor of the relationship.

text base. The aspect of the environment that supports the textual resources of the grammar and its semantics. The text base is concerned with the development of the text, the changing context and various textual statuses (identifiability, thematicity, newsworthiness, etc.).

text plan. A specification or blueprint for a text to be generated, giving e.g. the sequence of units to be generated and the rhetorical relations they enter into.

theme predication. Cleft or *it*-cleft in formal grammar.

theme identification. Pseudo-cleft or *wh*-cleft in formal grammar.

transitivity models. General model for organizing the configuration of a process plus its participants. Halliday (1967, 1967/8 etc.) discusses two transitivity models in relation to English, the transitive model and the ergative one. The transitive model is one of extension or impact: the fundamental question is whether the process the Actor engages in extends to a Goal (transitive) or not (intransitive). The ergative model is one of external causation: the fundamental question is whether the actualization of the combination of Process + Medium is caused externally by an Agent.

univariate. A type of structure, opposed to *multivariate.* In a univariate structure, each function stands in the same relation to the others. For example, as we build up a coordinate structure, each new element is related to the previous simply as the 'next' link in the coordination chain: *Tom* [Next:] *Dick* [Next:] *Harry* [Next:] *Sue* [Next:] *and Hellen.*

unit. Units are ordered by the rank scale (of a particular stratum) and are structured. The systemic notion of 'unit' is, in many respects, comparable to the AI notion of 'frame'.

upper structure. The most general taxonomy of the knowledge base, as developed for Penman: the general ontology. Domain models are classified under the upper structure. (Note that the upper structure is not a structure in the systemic sense and upper is not 'up' in stratal terms; it would be better to call it the most general taxonomy.)

word. The next lowest rank on the rank scale. In systemic theory, morphology is simply word grammar, i.e. the grammar of units of a particular rank, but it is not separated from 'syntax'. In Nigel, morphology is largely handled in the lexicon.

wording. The term is taken from 'folk linguistics'. Wording is the output of lexicogrammar to be realized phonologically or graphologically: the combination of 'words' (i.e., lexical items) and structure.

APPENDIX 2: SYMBOLS

System

'indicative'	Systemic feature.
/	Systemic disjunction.
&	Systemic conjunction.
† *	Marking convention: 'if, then'
{}	Selection expression

Realization

↘	Realization
/	Conflation
+	Insertion
:	Preselection
::	Lexical preselection
()	Expansion
^	Ordering
<>	Inclusion

Structure

@	Indicator of unmarked position for marked Theme.
‖‖	Clause complex, boundary markers.
‖	Clause (not rankshifted), boundary markers.
⟦⟧	Rankshifted clause, boundary markers.
//	Tone group, boundary markers.
/	Foot, boundary markers.
α	and other small Greek letters. Elements of hypotactic interdependency structure.
1	and other Arabic numerals. Elements of paratactic interdependency structure.
->	Interdependency relation.
Actor	and other terms with initial capitals. Function labels.